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Cement MILL EDITION of

Concrete

Devoted to the Manufacture,
and Use, of Portland Cement

JANUARY, 1932

400 West Madison Street
Chicago, Illinois

A Better Foundation for Faith

AT the beginning of this new year, to which we look forward with much hope, it is well to set forth the signs that support this hope.

¶ It is now well understood that the financial situation in foreign countries was the depressing influence that hung over the business world in 1931 and reversed the recovery that started in the early months of the year. The foreign situation is still far from being corrected, but the difficulties are now generally known, and many able minds are concentrating on their solution.

¶ In domestic affairs we have a constructive program of broad scope before a Congress that seems inclined to co-operate with the President. Opposition will be able to delay, but not to prevent, the consummation of the program.

¶ Measures have already been taken toward a partial correction of the banking situation, and further measures are in course of preparation.

¶ In the field of construction, state highway departments can be depended upon to bend every effort toward keeping up a pace comparable with the last two years. In building construction there are indications that the low volume of work awarded in the last few years has created a situation that will stimulate new construction as soon as the signs of recovery are more clearly defined. Moreover, a part of the national legislative program is designed to release frozen credits for use in home building.

¶ Now is the time of all times to face the future with renewed faith and determination, to take stock of the many new methods and new devices that have been made available to the construction industry, and to renew construction equipment in preparation for a year of increasing activity.

Slurry Filters Save Fuel at Manitowoc
Measurement of Minute Particles
Progress in Cement Industry

Wm. Howard Taft Junior High School, Oklahoma City, Okla. Architects: *Layton, Hicks and Forsythe.* Contractor: *William Lambert. Exposed concrete beam and ceiling slab formed with Tempered Presdwood.*

The beauty of plaster . . the economy of concrete formed with Tempered PRESDWOOD

Trade Mark Reg. U. S. Pat. Off.

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The Missing Pages In This Volume Are Advertisements

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With Which Has Been Combined Cement Age, New York, and Concrete Engineering, Cleveland

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Volume 40 January, 1932 Number 1

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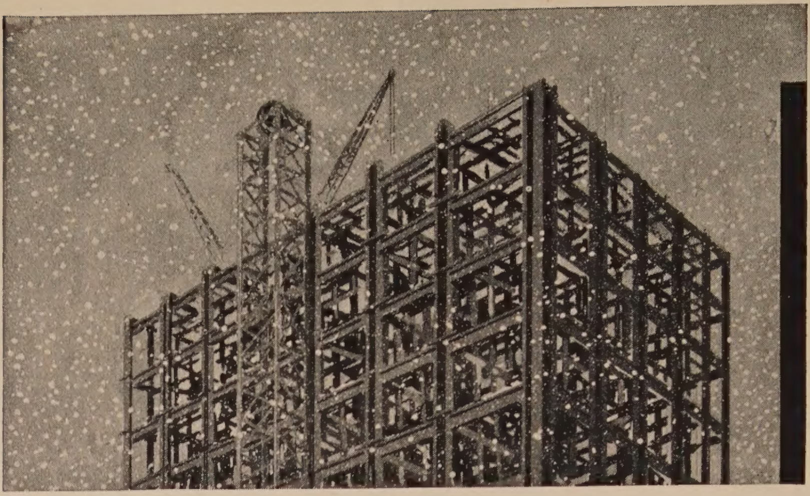

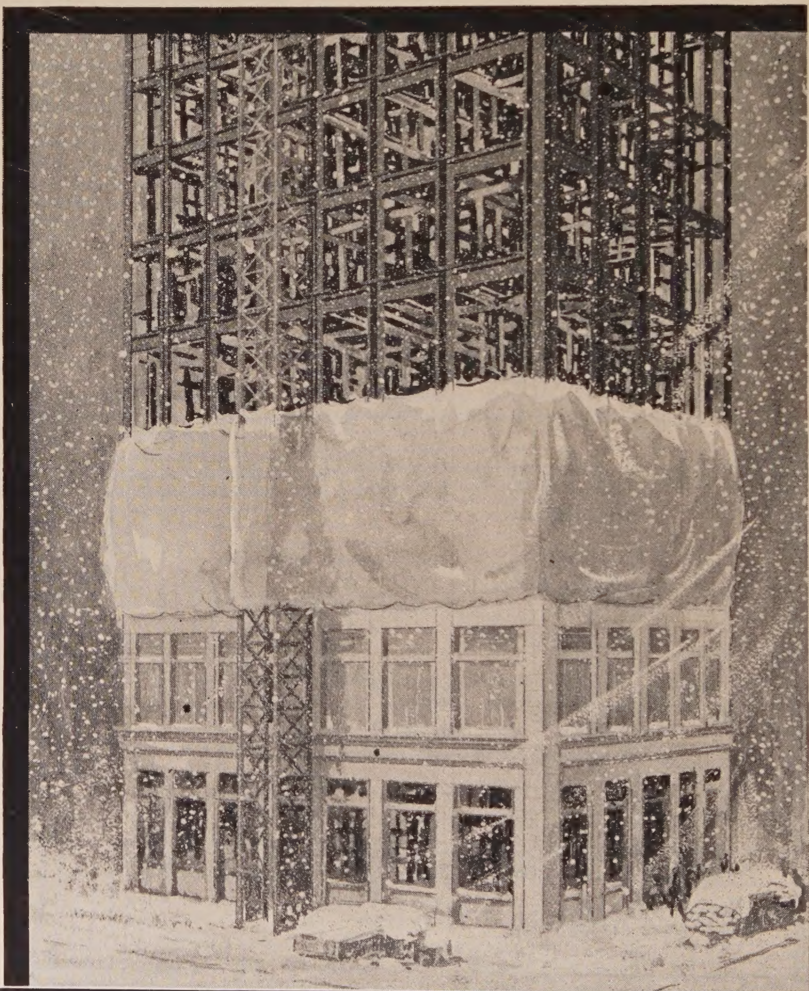

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Volume 40 February, 1932 Number 2

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THE VICTOR LAWSON MEMORIAL Y. M. C. A. BUILDING

Perkins, Chatten and Hammond were the Architects and Jacobson Brothers the General Contractors.

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PROFIT by reduced concreting costs. An engineering service that pays a dividend of 100% is worth while investigating.

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The services performed included analysis of all concrete materials and the design of the concrete mix, checking the alignment and construction of forms and the proper placing of reinforcements, compression tests of concrete cylinders to assure safety in removal of forms and quality of concrete, supervision of the curing of concrete under abnormal weather conditions; also inspection and tests of structural steel at mill and fabricating plant and field supervision of its erection.

The construction of this building and the economies effected are well described in the June issue of "Concrete" by Mr. E. B. White, in charge of the Architectural Department of the Y.M.C.A., Chicago.

A reprint of this article will be sent free on request.

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Volume 40 March, 1932 Number 3

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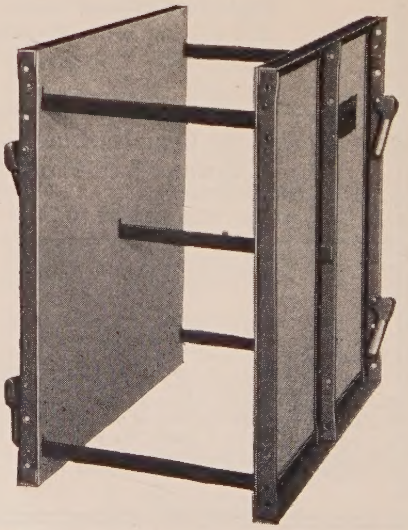

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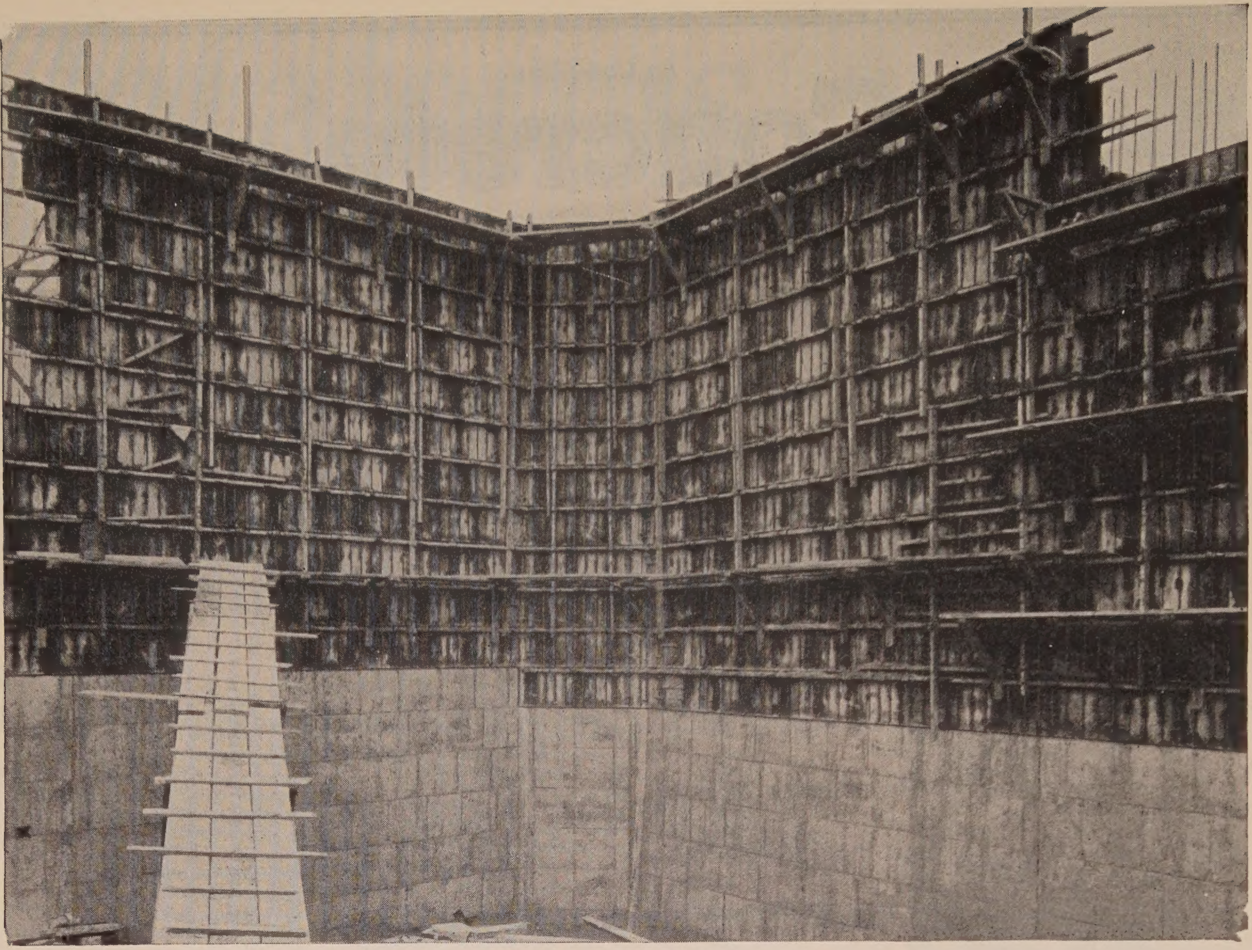

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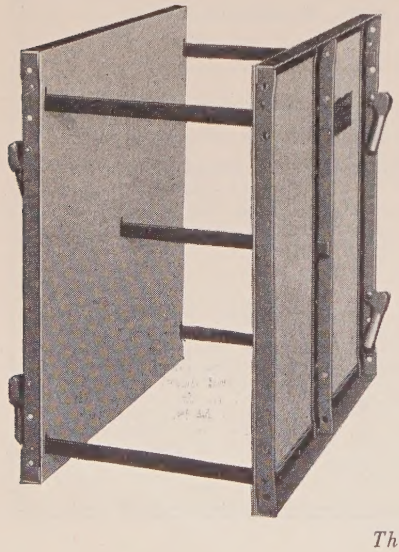

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A practical book that solves problems in the design and erection of any type of concrete structure. Full designs with tables and all necessary information for building of foundations, walls, columns, floors, roofs, staircases, beams, water tanks, retaining walls, lintels, formwork, saw-tooth roofs, etc. A mine of information to the novice and a fruitful source of advice for the experienced. Written clearly and plainly.

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BASIC PRINCIPLES OF CONCRETE MAKING. By Franklin R. McMillan, Director of Research, Portland Cement Association.

The author has culled the essentials out of a mass of scientific data on this subject and presents them with force and directness in this book. He shows the effects of quality of material, of proportioning, mixing, working and curing on the finished concrete.

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***MOLDS FOR CAST STONE AND CONCRETE.** By F. Burren and G. R. Gregory. Heavy board cover, 79 pages, 11 by 7½ in.; 44 full page illustrations. Price $1.25

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***GENERAL ENGINEERING HANDBOOK.** By Charles Edward O'Rourke and 29 associates. Flexible cover; 921 pages, 5 by 8 in., numerous tables, diagrams and illustrations. Price $4.00

This book assembles a great amount of fundamental engineering data in usable form. 31 separate sections deal with as many specific branches of engineering.

Of particular interest to engineers who specialize in the use of concrete as a structural material are sections devoted to "Highway," by Thomas R. Agg; "Reinforced Concrete Structures," and "Stresses in Framed Structures," by Charles Edward O'Rourke; "Engineering Materials," by Herbert H. Scofield; "Foundations," by Roland P. Davis; and "Mechanics," by Alfred P. Poorman.

REINFORCED CONCRETE CONSTRUCTION. By George A. Hool, Professor of Structural Engineering, University of Wisconsin. University of Wisconsin Extension Series.

Vol. I—Fundamental Principles. Third Edition. 380 pages, 6x9, 139 illustrations, 18 tables, 28 diagrams $3.50

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***CONCRETE ENGINEERS MANUAL.** By Samuel Baker and A. DeGroot. Cloth, 401 pages, 5 by 7½ in., numerous drawings, charts and tables. Price $3.00

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Among other subjects treated in individual chapters are form work, foundations, design of retaining walls, and estimating concrete work.

CEMENT CHEMISTRY IN THEORY AND PRACTICE. By Prof. Dr. Hans Kuhl, Director of the Institute for Cement Research, Berlin. Translated into English by J. W. Christelow, B.Sc. 64 pages, 6 by 9, cloth cover. Illustrated with a number of halftones and diagrams. Price $2.50

An authoritative book on the chemistry of cement, a translation of a series of lectures delivered by Dr. Kuhl in Moscow, at the special request of the Soviet government. The author presents the most up-to-date knowledge of the subject in simple language. The translator is one who knows his subject very thoroughly. The result is a concise record of modern research on the manufacture and setting of cement.

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5. The Chemistry of High-Strength Cements.
6. The Technical Aspect of High-Strength Cements.

PRE-CAST CONCRETE FACTORY OPERATION. By H. L. Childe, Editor, "Concrete Building and Concrete Products" (England). 190 pages, 5½x9, illustrations and layouts. Price $2.00

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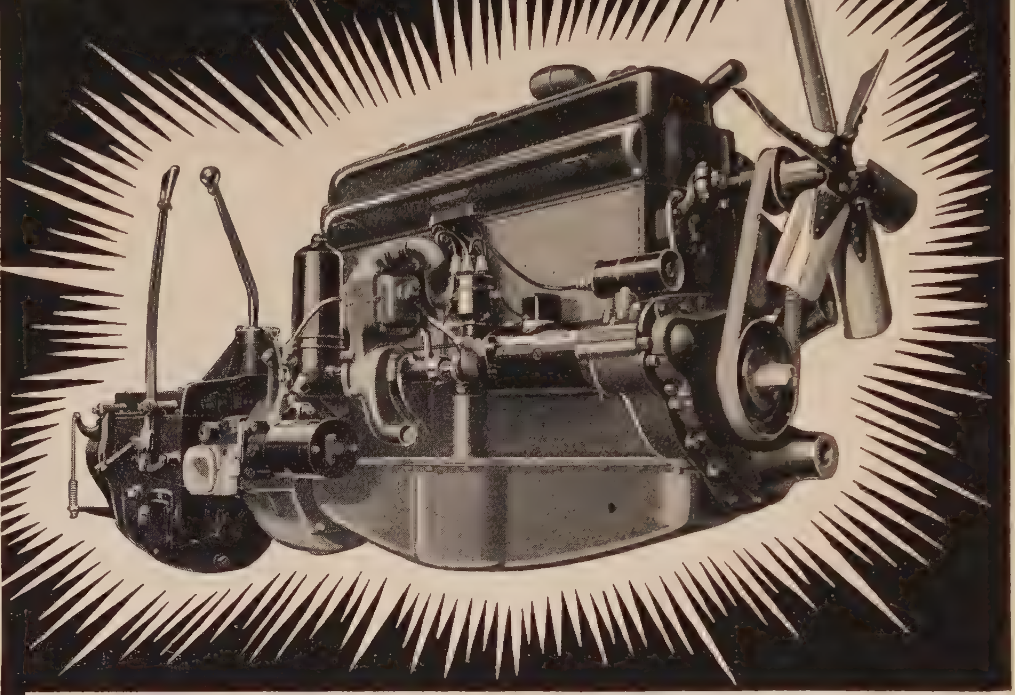

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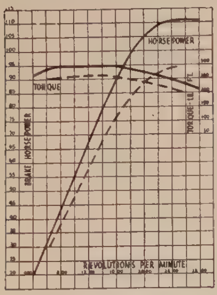

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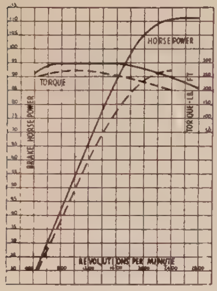

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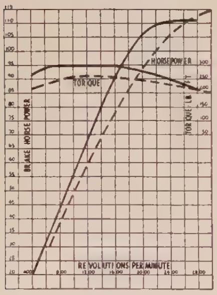

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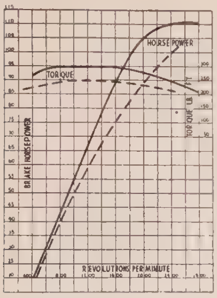

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Vol. XXXX
No. 1

Concrete

JANUARY
1932

Concrete Road Construction Makes New Record in 1931

Add 10,500 Miles to Nation's Highways—Street Yardage Drops Off—Concrete and Methods of Construction Improved—Winter Work in Prospect

WITH only eleven months of the year reported, it is expected that contracts awarded for concrete road construction in 1931 will be several million square yards above the 108,005,864 sq. yd. awarded in 1930. For the first eleven months of 1931 the total stood at 107,638,198 sq. yd. If the returns for December were to fall even as much as a million square yards short of December, 1930, the 1931 total would still be more than three million ahead of 1930.

Add 10,500 Miles of Concrete Roads

Thus the year just closed, when all contracts are completed, will have added the equivalent of some 10,500 miles of 18-ft. concrete pavement to the highways of the United States.

In concrete street and alley paving, contracts for 1931 are expected to fall about 15 million square yards behind the total for 1932. This means that all concrete paving awards in 1931, including roads, streets and alleys, will be about 12 million square yards below the record figure of 145,819,457 sq. yd. attained in 1930.

High-Early-Strength Cement Eliminates Detours

The use of high-early-strength cement is receiving more and more consideration as a means of shortening the time and cost of curing, and eliminating the cost and inconvenience of detours.

Many states have reported satisfactory experience with high-early-strength cement, either in paving town and village streets, filling in short gaps, or in paving important intersections. The use of this cement at intersections has assumed considerable importance in thickly populated regions. In mountain regions it has eliminated the inconvenience of long and difficult detours, aided by the further practice of concreting the road slab half at a time.

The Georgia state highway department specifies high-early-strength cement for the last few days of work on a project, thereby making it possible to open the entire project within two or three days after completing the placing of concrete.

Ready-Mixed Concrete

During the sessions of the American Road Builders' Association in St. Louis in January, 1931, considerable discussion was centered around the need for better distribution of the concrete delivered by the trucks. Many speakers considered it bad practice to dump the entire batch of ready-mixed concrete into one pile, and then spreading it by hand.

Several manufacturers have met this situation by developing hoisting devices that raise the discharge end of the truck body, thereby permitting the concrete to be distributed over a considerable radius through a swinging chute that forms a part of the truck equipment.

Tandem Concrete Mixers

Another recent development having considerable importance, because it increases the daily production of paving concrete without reducing the mixing time, is the practice of using two mixers in tandem. This method has been given a thorough trial on Missouri highway work.[1] In this plan the concrete was mixed by the first mixer for half a minute, then discharged into the bucket and deposited into the skip of the second mixer. The concrete was then mixed the remainder of the required time by the second mixer. On a paving contract in Illinois a similar arrangement of mixers permitted an average output of 70 batches per hour, though the combined mixing time for each batch was 1 minute and 15 seconds. Specifically, the output was increased by 50 per cent above the possible output of a single mixer.

Attractive grade separation structure on Indiana state road No. 37 cost only 5 per cent more than strictly utilitarian structure

Handling Bulk Cement

The use of bulk cement is now permitted, and even encouraged, by many state highway departments.

In some cases the bulk cement is taken directly from the railway cars with wheeled containers, to a platform adjoining the tracks, where it is weighed on a platform scale and dropped through chutes on top of the aggregates already in the truck. In other cases the cement is transported by bucket or belt conveyors to an elevated bin, from which charges for batches are delivered by gravity, through weighing devices.

Resurfacing Practice

The resurfacing of old concrete roads, often accompanied by widening, has become an important factor in many states having large areas of dense population. In many states the general practice is to widen the old pavement by adding strips or shoulders of new concrete along each side. If the old pavement surface is still in good condition, the surface of the new shoulders is made continuous with the old surface. If resurfacing is required, the new shoulders are at a higher level, in continuation of the new surface to be added. The practice in Virginia, for resurfacing old 16-ft. and 18-ft. pavements and widening them to 22 ft., is shown in Figure 1. The department is trying out this type partially as an experiment.

Single-Lane Concrete Roads

The construction of single-lane concrete highways, sometimes described as the farm-to-market type of road, is mainly a problem for county highway departments. The practice in Richland County, Ohio, and Champaign County, Ill., provided subject-matter for considerable discussion during the St. Louis meeting of the American Road Builders' Association. In the former county these secondary roads are built 10 ft. wide, to a uniform thickness of 8 in., with a 1:2:3½ mixture and 6 gallons of water (or less) to the sack of cement.

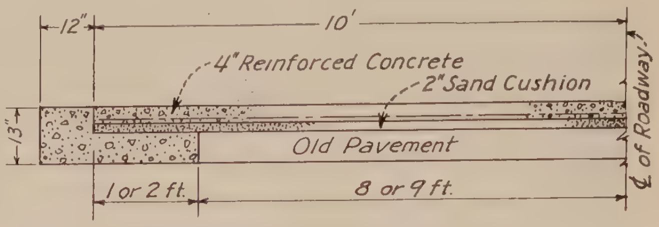

Figure 2. Sectional dimensions of single-lane concrete roads in Champaign County, Ill.

Secondary roads in Champaign County, Ill., are built as shown in Figure 2. Except for the increased slab thickness along the center line of the road, this is the same cross-section as half of the 18-ft. section of Illinois state roads.

Improving the Concrete

As in all previous years, highway engineers have devoted much thought and investigation to the problem of adding quality to concrete. Many states are now requiring two sizes of coarse aggregate as a means of obtaining greater density, and, in consequence, greater durability. In New York State three sizes of coarse aggregate are frequently specified, while the practice in Wisconsin is to specify two sizes of coarse aggregate when the maximum size is 2 in., and three sizes if the maximum is 3 in.

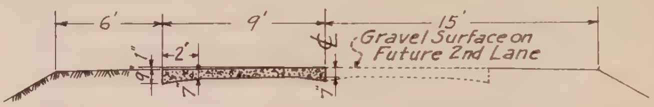

Figure 3. Sectional dimensions of single-lane concrete roads in Champaign County, Ill.

A minimum cement content is established in most states, the quantities ranging from 1.25 bbl. per cu. yd. of concrete in Wisconsin, to 1.70 bbl. in Utah. A majority of the specifications establish the minimum at or near 1.50 bbl. per cu. yd. of concrete.

New Jersey is conducting an extensive series of tests to determine the relative value of different portland cements.

Tests of Curing Methods

New Jersey is also making an elaborate test of curing methods, in continuation of experiments started in 1930. These experiments include the various methods now in use, and each experiment represents about 4,000 sq. yd. of pavement. The results of the tests are to be published in the near future. Several other states are conducting similar tests.

Experimental Roads

Previous reference has been made to the resurfacing and widening section with which the Virginia highway department is experimenting (Figure 1). In Sheboygan

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[1] See May (1931) issue of CONCRETE, p. 24.

[2] See CONCRETE, January, 1931, p. 27, and July, 1931, pp. 12-13.

County, Wis., a stretch of road 1,000 ft. long was built with the view of trying out a new practice in construction. The concrete after being placed to a depth about 1⅜ in. above the final slab surface, is compacted to the final level by a 3-ton roller. Other experimental stretches of road have been built in that state for the purpose of studying curing methods and expansion joints. In Texas experiments are being tried out with joints designed especially for use in areas containing gumbo soil.

Winter Work on Structures

Construction of bridges, culverts and grade elimination structures will be continued throughout the winter in many northern and eastern states, as well as in the milder sections of the country. Ohio has appropriated $3,000,000 for the construction of bridges, 142 contracts having been awarded as a result of this action. Most of these bridges will be completed before spring. In Wisconsin a large grade elimination program, started last spring and involving 93 grade separation structures, is about half completed, and work will be continued throughout the winter. A special effort is being made in Maryland to award the largest possible number of bridge contracts as a means of relieving unemployment. Practically all highway departments are giving attention to this problem.

Expect 1932 to Equal 1931

While not all highway construction programs for 1932 can be determined at this time, highway engineers in most of the states expect their programs to equal those of 1931. Considering the pressure under which most highway departments operated in 1931, an even break with the year just closed is about the limit of what may be expected for 1932.

Composite Floor Type Eliminates Use of Concrete Forms

Structural Concrete Slab and Hollow Gypsum Units Supported by Steel Frame—Applicable to Reinforced Concrete Frame

A NEW type of fireproof floor construction that involves the use of light reinforced concrete construction and hollow gypsum units in conjunction with a reinforced concrete or a structural steel frame, has been installed in the upward extension of the Rothschild Building, recently completed at the southwest corner of State Street and Jackson Boulevard, in Chicago.

The extension to the Rothschild Building (Figure 1) has a typical structural steel frame, with all floor girders and beams incased in concrete. The steel floor beams, consisting of 10-in. I's, are spaced 6 ft. center to center. The details here illustrated are, in consequence, applicable to the case of a steel framed building, although the reader will readily see how, with slight modification, this type of floor construction could be utilized with a frame of reinforced concrete.

Details of New System

Part of the floor finish in the Rothschild Building consists of wood flooring nailed to wooden sleepers embedded in the concrete floor slab, while other parts of the building have linoleum laid directly on the concrete. A cross-section of each type of floor finish is shown in Figure 2.

Figure 2 also shows how the hollow gypsum units are supported on the flanges of the steel floor beams, with a bearing of 1½ in. on the flange.

Concrete Floor Designed to Carry Loads

The hollow gypsum units have ample strength to support the reinforced concrete floor slab and various other construction loads until the concrete has hardened.

The reinforced concrete floor is, in fact, designed to carry the entire floor load imposed on the construction. As shown in the cross-sections in Figure 2, the depth from the top surface of the concrete to the steel reinforcing bars (the "effective" depth employed in design) is increased through the simple method of beveling the top corners of the gypsum units, which gives a miniature concrete beam every 12 inches.

How the Units Are Placed

The placing of the 6-ft. gypsum units, each weighing 100 lbs., is shown in Figure 3, where two workmen are placing the last unit of a panel. The procedure is simple. The unit is held by two straps slung around it. The man nearest the camera has let his end down below its final position. Next the far end was let down into its proper position and the bearing slot was slipped over the flange of the 10-in. steel floor beam. The bearing slot, however, has a little more than twice the depth needed for bearing, thereby providing sufficient play to permit the near end to be raised to its proper level, after which the unit is pulled back toward the near end until it has a bearing of approximately 1½ in. on the steel flange at each end.

After the gypsum units on a floor were all placed, cement-and-sand mortar, or grout, was placed in the incased spaces along the sides of the beams and girders, as shown at the right of Figure 2. The same sketch shows how the protruding lips at each end of the gypsum units protect the bottom of the I-beam flange, this protection having been increased when the joints between the gypsum units were pointed, and again when the ceiling was plastered.

No Shores or Form Work Needed

From the placing procedure just described it will be seen that neither clips nor hangers are required, since the gypsum units are supported directly on the flanges of the steel I-beams. Shores, likewise, are eliminated in the case of a steel-framed building such as this. The absence of shores may be seen to the best advantage in Figure 1, showing that almost complete freedom of movement is possible on the several stories.

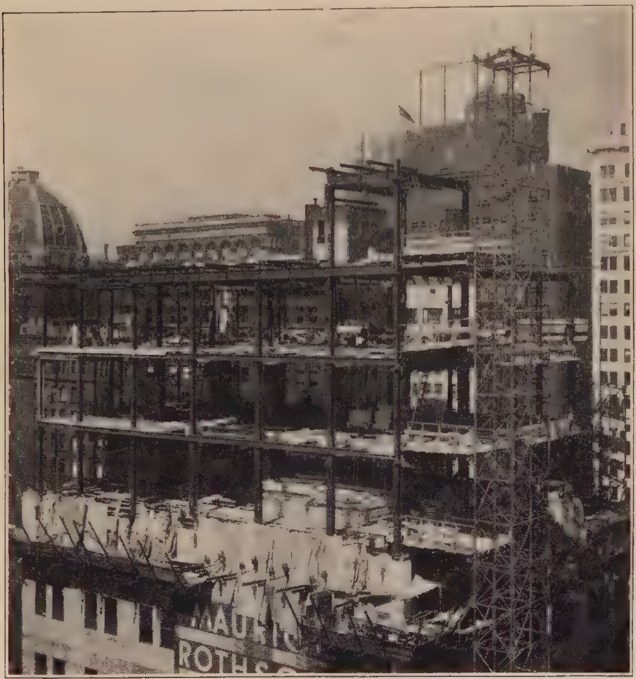

Figure 1. Absence of shores is characteristic of new type of floor construction

It will be observed, too, from Figures 2, 3 and 4, that the hollow gypsum units formed a complete mold for the concrete floor, and that no form work or shoring or bracing of any kind was needed.

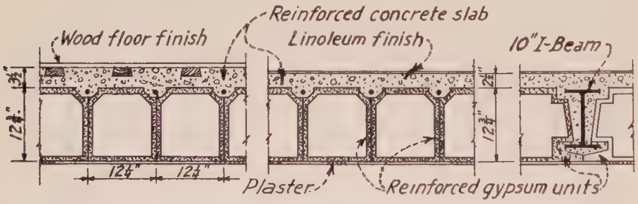

Figure 2. Details of composite floor construction

The ceiling plaster was applied directly to the bottom face of the hollow units, no metal lath having been required.

Speed of Placing

The Rothschild Building is located in the congested loop district of Chicago, which fact necessitated delivery of the gypsum units by truck.

The speed attained in placing the floors may be visualized from the fact that a crew of 12 men and one foreman hoisted the units from the street and placed 4,800 sq. ft. of floor in a day of 8 hours.

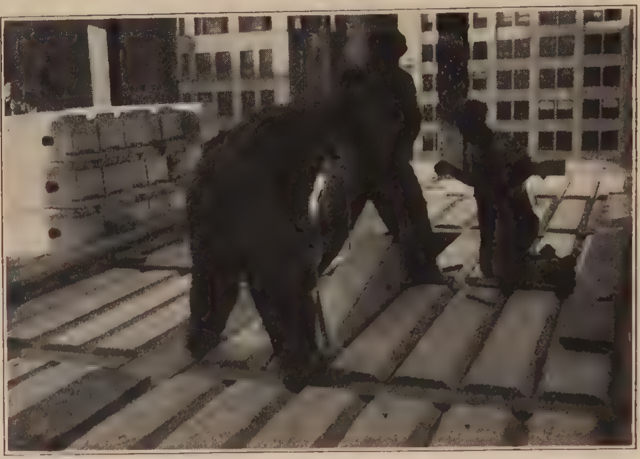

Figure 3. Procedure in placing hollow gypsum units

Acknowledgments

The general contract for the Rothschild Building extension is held by the Avery Brundage Co. of Chicago. The floor construction here described is known as the "Unitrave" system and was placed under sub-contract by the Unitrave Engineering Co., of Chicago.

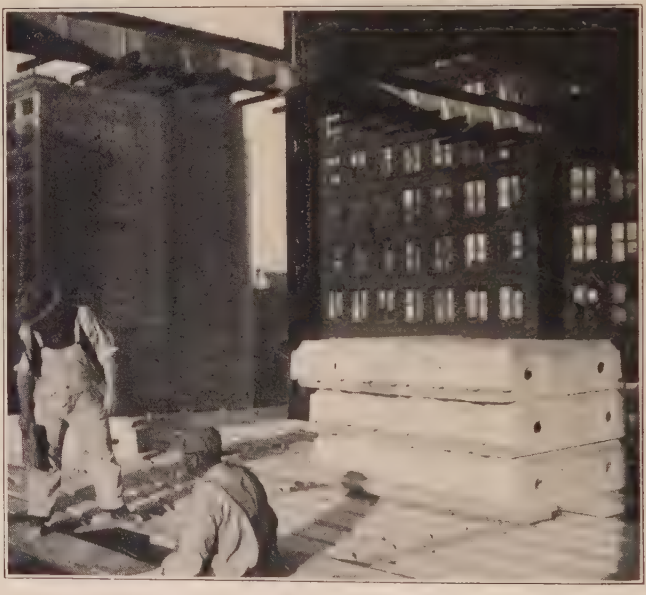

Figure 4. Gypsum units, in place, form deck for placing structural concrete slab. Stack of 18 units in center of picture

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Crushed Stone Convention and Exposition in Pittsburgh

The National Crushed Stone Association will meet in its fifteenth annual convention at the Hotel William Penn, Pittsburgh, Pa., on January 19 to 22.

The Manufacturers' division will hold its annual exposition of quarry equipment, machinery and supplies in connection.

Controlling Durability of Concrete Highway Construction

Density Most Important Factor in Attaining Durability —Strength, Workability and Sound Aggregates Also Needed—New Jersey Methods Described

By R. B. GAGE
Chemical Engineer, New Jersey State Highway Department

THE writer was very much interested in your article in the May (1931) issue of CONCRETE regarding the procedure used by the various states in proportioning and batching concrete. Apparently most of the state highway departments realize the importance of eliminating the variable factors that lower the density and strength in concrete.

The methods used by New Jersey, the writer believes, will give the densest and strongest concrete that it is possible to obtain with a given cement and aggregate. The strength might be increased somewhat by further reduction in the sand content, but on the other hand this would increase the difficulties in finishing and placing of the concrete which, no doubt, would in most cases result in the use of excess mixing water to obtain workability. This would lower both the strength and the density of the concrete.

The precautions we have taken in New Jersey to insure density and strength in concrete were briefly outlined in a paper read by the writer last February at the Atlantic City convention of the North Atlantic States Highway Association. The paragraphs that follow contain the essential features of that paper, in condensed form.

In estimating or establishing the relative value of a given grade of concrete, durability is undoubtedly the most important factor to be considered. It is rather difficult to pre-determine just what the life of a given grade of concrete may be, for not all concrete is affected in the same manner by the various adverse agencies which attack it.

Density in Relation to Durability

Unfortunately, the relation between density and durability in concrete has never been definitely established. The extent to which the life of concrete depends upon its density, has certainly not been given the consideration it deserves in designing concrete mixtures for definite purposes.

Destructive action is not always of a chemical nature. The action of such atmospheric agencies as heat, cold, and moisture are generally physical, as well as chemical. The action of these agencies increases as the density of the concrete decreases. The scaling of a concrete pavement is more of a physical than a chemical process, made possible by the porous condition of the concrete surface. If such surfaces were made impervious to water, frost action and stresses produced by the unequal absorption of water would be eliminated.

The quantity of fine aggregate required to obtain maximum strength and density is governed by the void content of the coarse aggregate. There must be sufficient fine aggregate present to fill the voids in the coarse aggregate, plus the excess needed for workability. This excess has been found by practice to be from 10 to 11 per cent.

Void Content of Coarse Aggregate

When the fine aggregate required is a function of the void content of the coarse aggregate, the cement required per cubic yard of concrete will be practically the same for a given grade. The composition of the mortar, however, will vary with the void content in the coarse aggregate. As this void content increases, the cement content of the mortar will consequently decrease in direct proportion. When this void content exceeds 45 per cent, the deficiency of cement in the mortar begins to affect the workability of the concrete. This is particularly noticeable with certain cements and sands. In order to insure that the concrete will have the desired strength and workability in such cases, the coarse aggregate is reduced so that the cement content of the resulting mortar will not be less than 1 part cement to 1¾ parts of fine aggregate.

Since the strength and density of the concrete generally depend upon the richness of its mortar, the composition of which is governed by the void content of the coarse aggregate, it is of vital importance that the void content of the coarse aggregate be reduced to a minimum, and uniformly maintained at this minimum.

Cements

It is very difficult to predict just what workability a given combination of aggregates will produce. Different cements and sands affect the workability to a greater extent than is generally realized.

Concrete prepared with some cements will have good workability, but a low compressive strength; while other cements produce mixtures having good workability and fairly high strengths. The inherent characteristics of different cements appear to affect the strength and density of concrete considerably more than is realized or thought possible, although these different cements all pass the standard A. S. T. M. requirements.

Preparation of Concrete

Regardless of the care taken to insure that materials are of proper quality, correctly graded, and used in the quantities required, the durability that would ordinarily be thus secured will be greatly reduced by improper preparation of the concrete.

Unfortunately, the density of a concrete pavement appears to be lowest where it is needed the most—in the surface. Tests made of cores taken from concrete pavements frequently show that the concrete in the surface of a pavement has as much as 2 per cent more absorption than that in the bottom part. This is particularly true where excess mixing water is used, or where the cement will not hold the water necessary for proper preparation of the concrete.

Excess mixing water not only lowers the quality of the concrete, but may ruin it. Regardless of all previous efforts, such concrete will be deficient in both strength and density.

Should Require 5,000-Lb. Concrete

These statements may appear rather positive, but they are based upon service records of different types of concrete pavement constructed in New Jersey during the past 15 years. From these service records, it would appear that if a concrete pavement is to give the service desired, when subjected to traffic and climatic conditions such as occur in New Jersey, the concrete used in its construction should have an average compressive strength at 28 days of not less than 5,000 lb. per sq. in. Concrete pavements have been constructed in New Jersey, with strict attention to the above mentioned factors, that have the required strength and density. Some of these pavements have been in use for several years, and to date they show little or no evidence of premature disintegration. We have every reason to believe they will continue to prove durable, and give the service expected.

Summary of Methods

The methods employed in New Jersey to insure that the concrete will have the required strength, density, and durability, can be stated briefly as follows:

1. The equipment used in the preparation of different grades of aggregates has been so standardized as to insure a uniform grade of product.
2. Sufficient skilled inspectors are employed to insure that the materials supplied do comply with the requirements and are kept uniform in composition.
3. The coarse aggregate is required to be produced and shipped in two separate sizes.
4. The different sizes of the coarse aggregate are so proportioned that the resulting product will have the minimum void content.
5. The quantities of the different aggregates required per batch are determined by weight. A 3-bin batcher of the weighing type is used for this purpose.
6. The method of operating the batching equipment and determining the grading and moisture content of the aggregates is checked at frequent intervals by a batching plant inspector, whose duty is to see that the materials are kept properly graded, and used in the quantities required.

To insure that concrete will have the desired consistency, particular care has been used in the preparation of specifications in this respect.

The equipment used in the preparation of concrete has been definitely defined, particularly that part which measures the water. The mixing time has been increased to insure maximum workability with a minimum mixing water content.

Every effort has been made to prevent lowering the quality of the concrete because of improper methods of preparation. The consistency and appearance of the concrete, when dumped from the bucket, after placing, and when given the final finish, are designated. Strict attention is also given to proper curing.

The concrete must have a minimum compressive strength, when 28 days old, of at least 5,000 lb. per sq. in., to be considered of a satisfactory character.

The factors governing the durability of concrete, enumerated in the order of their relative importance, are density, strength, workability, and the use of sound, durable aggregates.

The density and strength of the concrete, in turn, are usually governed to a great extent by the grading and density of the aggregates, by the method of preparation of the aggregates, by the method used in preparing the concrete, and by the manner in which the concrete is placed and cured.

Concrete Highway Design and Construction Practice

A new series of articles on the design and construction practices of state highway departments will be started in the February issue of "Concrete."

What are some of the practices in widening or resurfacing old concrete roads?

What new facts have highway engineers learned from experimental stretches of concrete road, and from other tests and investigations?

To what extent is bulk cement being used, and how is it handled?

In what ways has high-early-strength cement demonstrated its value in highway construction?

What are the special advantages of ready-mixed concrete?

These are some of the questions that will be answered in this series of articles. What is of more importance, the answers come from state highway engineers themselves—in letters written to "Concrete."

In this manner the experiences and practices of one highway department will be passed on for the information of all.

Advance Market Developed for Back-Up Units

Products Company Avoids Additional Plant Investment During Development of Market—Stock Obtained from Another Plant—Three Years Prove Wisdom of Arrangement

A MARKET for light-weight concrete back-up units and light-weight concrete brick has been developed in Madison, Wis., by the Blue Jay Concrete Products Co. in advance of the installation of material-handling and manufacturing facilities for producing this type of unit.

Company's Main Line Is Cast Stone

The main line of the Blue Jay company has been cast stone since the plant was established in 1926. In the meantime other concrete building products were manufactured on a moderate scale.

Beginning with the year 1929, the company management decided to enter the field of light-weight concrete back-up and partition units. This step seemed entirely logical, for practically all buildings that utilized cast stone also utilized light-weight back-up and partition units of some kind. In a word, nearly every contract for supplying cast stone was an invitation to go after the back-up and partition material needed in the same structure.

Obtain Light-Weight Units from Another Plant

Following a study of changes and additions to plant facilities necessary for the manufacture of light-weight units, it was found that, while but little additional equipment would be needed, an extension would have to be built to the plant to provide the additional working space, curing tunnels, and so on.

Avoid Increased Plant Investment

Officials of the company hesitated to assume the expense of building the necessary addition before having some idea of the size of the market. Accordingly, an arrangement was made to obtain light-weight concrete units from a large products plant in Wauwatosa, Wis., some 60 miles from Madison.

The Wauwatosa plant (the Economy Concrete Products Co.) had developed a large market for light-weight units employing pottsco as the aggregate, so that the product of this plant had a well established reputation for quality. There was no question of the ability of the Wauwatosa plant to supply the extra output that might be required in Madison.

Considering the question from all sides, the decision to defer the extension of the plant and manufacturing facilities at Madison seemed most logical.

Promoting the Back-Up Units

Early in 1929 the first shipment was received from Wauwatosa and put in stock. An aggressive campaign was inaugurated. Calls were made on architects and prospective owners alike. Samples of the product were left in the offices of architects, and the insulating properties of pottsco were explained and supported by reports of laboratory tests. Demonstrations were given to show that nails could be driven into the units, that holes could be drilled into them, and that the units could be sawed with an ordinary carpenter's saw.

Fire-Box Lining as Practical Proof

Another very practical demonstration proved the insulating value of concrete in which this special aggregate was employed. This was the performance of the fire-box lining in the boiler at the Blue Jay company's plant, the lining having been built of brick made with this aggregate.

Plant of the Blue Jay Concrete Products Co., Madison, Wisconsin

The temperature in the fire-box runs about 2,500 deg. F., and usually the brick lining is heated to a white heat. In spite of the severe conditions of service, an examination showed that only about 1/32 of an inch of depth had returned to a slag condition after a period of more than a year.

Special Arrangement Proves Success

The wisdom of the decision to develop the light-weight unit market before building a plant extension and installing additional equipment has been well demonstrated. It would have proved a wise move even if construction conditions had remained normal.

The truth of the assertion just made will become clear from a study of the sales attained. In 1929 the Blue Jay company marketed the equivalent of 90,000 units 8 by 8 by 16 in. in size. Sales in this department mounted to 160,000 equivalent units in 1930. The total for 1931 held up well in face of the drop in general building construction.

There is every reason to believe that with the resumption of normal construction activities the sales in this special field will mount to a point that will justify the Blue Jay Concrete Products Co. in starting the manufacture of these products in its own plant. In the meantime the company has avoided the extension of its capital investment in plant and equipment, during the period of market development.

C. Clare is manager of the Blue Jay plant, which is located at 2010 Pennsylvania Avenue, Madison, Wis.

Intensity of Pressure Under Footings

British Engineer Compares Curved Pressure Distribution with Straight-Line Method Used by Griffith

In a letter discussing James R. Griffith's article and chart on the intensity of pressure under footings, printed in the April (1931) issue of CONCRETE, Arthur C. Vivian, Potters Bar, Middlesex, England, compares Professor Griffith's results with his own.

Mr. Vivian is the author of the publication, "A Theory of Earth Pressures," to which he refers. His letter follows:

Professor Griffith's article "Short-Cuts in Structural Design, II—Intensity of Pressure Under Footings" suggests to me that your readers may be interested to examine an alternative method which has the merit of requiring no chart for obtaining the value of the multiplying factor.

The principle is explained in "A Theory of Earth Pressures," Selected Engineering Paper No. 58, 1928, of the Institution of Civil Engineers, England, a copy of which I have pleasure in sending under separate cover. The application of the principle to loadings in a direction diagonal to rectangular bases is illustrated in "An Extension of the Middle Third Theory," *Engineering* (England), December 5, 1924.

The solution of the particular examples stated by Professor Griffith according to the method now offered is as follows:

(1) Wind parallel to side, $d = 28$ feet.
$M_d = 2{,}720{,}000$ ft.-lb.
$M_b = 0$
$W = 1{,}693{,}000$ lb.

$$\text{Eccentricity, } e = \frac{M_d}{W} = 1.60$$

$$J = \frac{14 + e}{14 - e} = 1.26\ (K_R)$$

$$\text{Max. pressure} = J\frac{W}{bd} = 3{,}800 \text{ lb. per sq. ft.}$$

i. e., 7 per cent less than the conventional solution.

(2) Wind parallel to side, $b = 20$ feet.
$M_d = 0$
$M_b = 2{,}720{,}000$ ft.-lb.
$W = 1{,}693{,}000$ lb.
Eccentricity, $e = 1.60$

$$J = \frac{10 + e}{10 - e} = 1.38\ (K_R)$$

i. e., 7 per cent less than the conventional solution.

(3) Wind parallel to diagonal.
$M_b = 1{,}580{,}000$ ft.-lb.
$M_d = 2{,}210{,}000$ ft.-lb.
$J_b = 1.21$
$J_d = 1.21$
Multiplying factor $= J_b \times J_d = 1.46\ (K_R)$
i. e., 5 per cent less than the conventional solution.

The reason why the solutions I have given are a little less than those given by Professor Griffith is, I think, because my method assumes that the stress distribution line may be of curved shape, while Professor Griffith's chart is based, I understand, on the conventional, but not entirely warranted, assumption that the stress distribution line under a footing must always be a straight line. It may be noted, however, that if the resultant lies outside the kern, the method now offered will give results slightly in excess of the conventional solution, and increasingly in the direction of safety as the eccentricity of the load increases.

Committee on Admixtures Holds Meeting in Cleveland

The manufacturers' committee on admixtures, which was organized during the last annual meeting of the American Concrete Institute, as described in an article in the May (1931) issue of CONCRETE, pages 37-38, held its third meeting in Cleveland on December 15.

A proposed specification covering the classification and use of waterproofing and plasticizing materials, hardeners, calcium chloride combinations, and related materials, was considered at the Cleveland meeting, and further steps were taken with the view of co-operating with the American Concrete Institute's committee on admixtures.

The Cleveland meeting was attended by representatives of nearly all manufacturers of admixtures.

New Series on Control of Concrete Mixtures

A new series of articles by Joseph A. Kitts, concrete technologist, in which the basic principles of concrete mixtures will be co-ordinated, will be started in an early issue of "Concrete."

This series of articles will not be controversial in character. Instead, it will reconcile the various theories of mixtures advanced by recognized authorities on concrete. While in some instances it will be necessary to point out the limitations of certain theories, any criticism will aim to be constructive.

In the forthcoming articles Mr. Kitts will elaborate upon some of the phases of concrete-making that were touched upon in his articles on "Co-ordinated Laws of Concrete Mixtures and Their Application," which appeared in the November and December issues of "Concrete."

Resurface Old Roads and Streets With Concrete Slabs

Construction Practice on Five Resurfacing Projects in and Near Chicago—Steel Reinforcement Used in Three Cases—Cost Data

THERE are, in and around Chicago, five roads or streets which have been reconstructed by resurfacing an old concrete base with a layer of new concrete pavement. One of these was built so long ago that it may be used to judge what can be expected of concrete resurfacing; the others were completed during the 1931 construction season and indicate present-day practice.

The oldest resurfacing is on State Route 1, beginning at the southern limits of Chicago Heights and running south a distance of 1.2 miles. It was resurfaced in 1922 by the state of Illinois. In 1928 the two-lane pavement was widened to 40 feet, but the resurfaced section was not altered.

Resurfacing Slab of Reinforced Concrete

The 18-ft. pavement was originally a 2-in. asphalt top on a 4½-in. 1:3½:6 concrete base. When numerous holes appeared in the asphalt surface it was removed and replaced by a 6-in. layer of 1:2:3½ concrete, reinforced with wire mesh. The base was cleaned by sweeping with brooms, but no other attempt was made to bond the top to the base.

The present excellent condition of this resurfacing is shown in Figure 1, from a photograph taken in 1931, when it was 9 years old. The two inner lanes are the resurfaced part. It is good for at least 20 years of additional service on one of the heaviest traveled roads leading out of Chicago. Longitudinal joints were not installed during construction, and consequently there was some longitudinal cracking. Transverse joints were only put in as construction joints, at noon and night stops, and, as had been anticipated, some transverse cracks had formed. These averaged 26 ft. apart, which is about the crack interval expected in pavements of that age, in this climate.

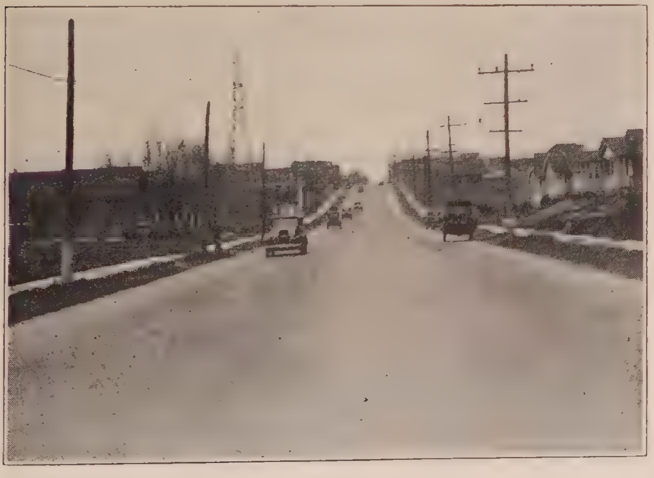


Figure 1. A 9-year-old resurfacing slab on Illinois Route 1

Obtaining Bond with Old Pavement

The State of Illinois constructed a section of experimental concrete resurfacing on Route 42-A during 1931. The old pavement was asphaltic concrete on a 6-in. 1:2:3½ concrete base and was built in 1921. A 500-ft. section was resurfaced with a 2½ to 3-in. layer of concrete, the thickness being governed by the height of the curb which bordered the asphalt surface. On part of this section high-early-strength cement was used; on the balance the mix was 1:1½:2½, the rich mixture being used to assure strength for early opening.

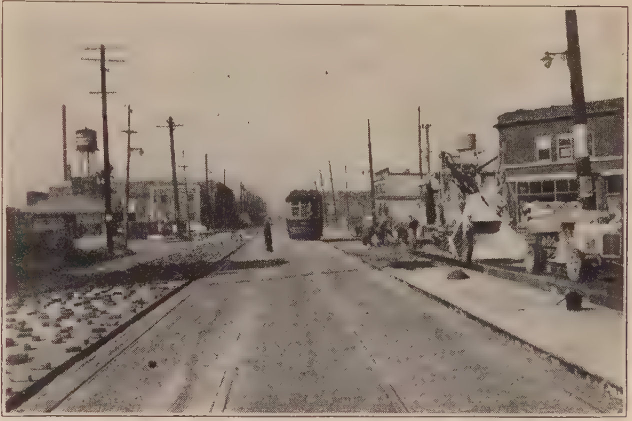


Figure 2. A 5-in. layer of plain concrete being laid over an old concrete base in Chicago

Bond was secured between the base and the resurfacing layer by first sweeping the old base clean and then, just ahead of the new concrete, brooming on a stiff cement grout. Reinforcement weighing 42 lb. per 100 sq. ft. was put in half of the section; the balance was not reinforced.

Within the city of Chicago, sections of two streets were resurfaced with a total of 37,000 sq. yd. of 5-in. concrete over old concrete bases. On one—Fullerton Avenue—the old pavement surface was wood block, and on the other—South Chicago Avenue—it was brick.

Concrete Surface Replaces Brick and Block

On both streets the width between curbs is 60 ft., and there is a double car track down the center. Both streets carry heavy truck traffic which had worn the area on either side of the car track so rough that some sort of reconstruction was essential. The balance of the street is used largely for parking, and was not so badly worn that it would not serve satisfactorily for that purpose. So it was decided to pave a 10-ft. strip on each side of the car tracks. After the pavement was completed the disturbed blocks in the older pavement were relaid against the edge of the new slab.

Neither reinforcement nor joints were used. The base was swept clean and the concrete was deposited directly on the old concrete. The result is a full width traffic lane on each side of the car tracks. The work in South Chicago Avenue is shown in Figure 2.

The cost of removing the old surface, building the 5-in. concrete slab and replacing the disturbed blocks along each edge of the concrete was $1.49 per square yard for one job and $0.90 for the other. That does not include the cost of cement, which was furnished by the county. On Fullerton Avenue, where the old paving was wood block, the waste blocks were carried away by people living along the street, to be used as fuel.

Resurfacing Four Business Streets

In Elgin a total of 10,800 sq. yd. of concrete resurfacing was laid on four streets in the downtown business section. The old pavement on these streets was brick that had grown too rough for further service.

Wherever the 27-year-old 5-in. concrete base was badly broken it was replaced with 1:2:4 concrete before the resurfacing layer was put on. Sand from the cushion in which the brick had been bedded was used to level up minor inequalities in the base and to form a ¾-in. layer separating the resurfacing from the base. As heavy traffic was anticipated, the resurfacing slab was made 7 in. thick and was reinforced with mesh weighing 83 lb. per 100 sq. ft. The concrete was proportioned 1:1½:2½, and light-weight vehicles, such as automobiles and the smaller trucks, were allowed to use the pavement in 3 days. The resurfacing was from 34 to 42 ft. wide and was divided into four lanes by three longitudinal joints. Transverse expansion joints were put in at 30-ft. intervals.

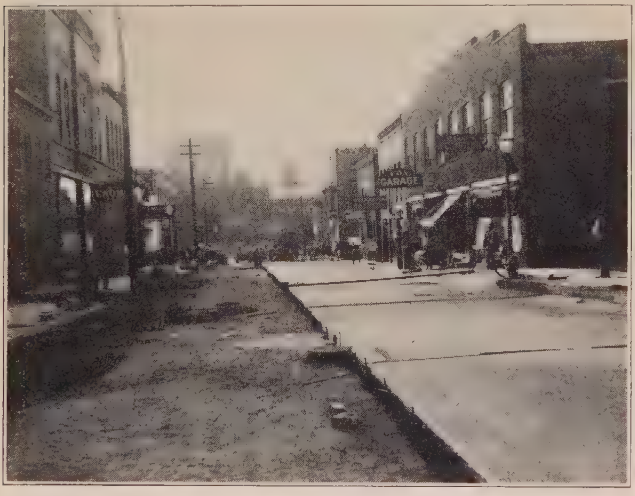


Figure 3. Replacing old brick surface in Elgin business street, half at a time

The telephone and gas companies and the electric light company took advantage of the repair work to put all their surface pipes and wires below ground.

The Elgin resurfacing cost $2 per sq. yd. and the contractor was paid $0.10 per sq. yd. for removing the old brick.

Road Builders Open at Detroit on January 11

Final plans are being completed for the American Road Builders' Association convention and road show at the Municipal Airport Building at Detroit, and the five-day program will begin on Monday, January 11, when the exposition opens its doors at 9 a. m.

At 2 p. m. the Committee on Highway Location will report on recent developments in surveying methods and equipment. Another paper to be read at the same time will be that of the Committee on Bins, Batchers and Equipment for Handling and Weighing Bulk Cement.

A combined session on plain and reinforced concrete highways will start at 10 a. m. on the following day. Reports to be heard at that time also will be those on design and construction of concrete highways, on single track concrete roads, and on reinforced concrete pavements and bases.

Central and truck-mixed concrete will be the subject of a report to be presented on the morning of Wednesday, January 12. The report of the County Committee on Design and Construction and the County Committee on Maintenance will be heard in the course of the same day's sessions, as will that of the City Committee on Airports.

Durability of Highway Concrete Dependent on Cement Content

The eleventh annual meeting of the Highway Research Board was held at Washington, D. C., December 10 and 11.

Papers scheduled for presentation included two on the "Effect of Hot Cement on Time of Setting and Quality of Concrete," and "Durability of Concrete," both by H. S. Mattimore. That there is a decided relation between the water-cement ratio and durability is the conclusion reached in the latter, following investigations into the relation between resistance to frost action and water-cement ratio, the maximum water-cement ratio allowable for concrete exposed to the weather, and the relation between strength and durability.

Other papers to be presented were those on "Results of Research on Volume Changes in Concrete," "Functions of Steel Reinforcement in Concrete Pavements and Bases," and reports of a project committee on curing of concrete pavement slabs and of a special investigation of a method for evaluating field inspections of culverts.

California Pipe Manufacturers Hold Two-Day Meeting

The quarterly meeting of the California Associated Concrete Pipe Manufacturers was to be held at the Hotel Fresno, Fresno, Calif., on December 18 and 19.

According to the program contained in a 4-page news letter, some of the matters that will come up for discussion and action are the final discussion and revision of the "Specifications for Standard Concrete Irrigation Pipe," of the "Recommended Practice for Laying Tongue and Groove Concrete Irrigation Pipe," and preliminary discussion of the plan for a bulletin on "Recommended Practice in the Use, Operation and Maintenance of Concrete Pipe Irrigation Systems."

Colored Ornamental Products Hold Market in Surrounding Area

Colored Burial Vaults Share Business of Plant at Akron, Indiana—Developing Market for Ornamental Products —Output Is Diversified

THE existence of a market for special concrete products in small communities has again been demonstrated by Fred Walgamuth, owner and manager of a plant at Akron, Indiana.

The population of Akron is just under one thousand. Larger surrounding towns include Rochester, 10 miles away; Warsaw, 20 miles, and North Manchester, 15 miles, with populations ranging from 2,000 to 5,000. Sales have been extended to these towns, as well as to the farms and smaller towns in the same region. Summer homes at the larger lakes in this territory also provide some market for ornamental products.

Ornamental Products and Burial Vaults

The output of the Walgamuth plant (Figure 1) includes diversified products, building block among them, but the main lines are colored ornamental concrete products and concrete burial vaults, also colored.

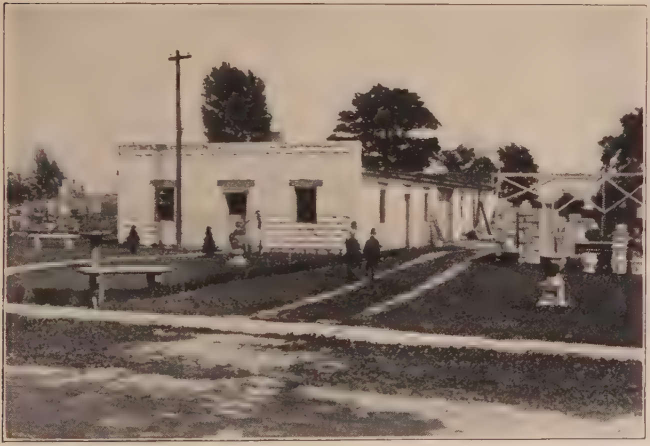


Figure 1. Colored ornamental concrete products are the principal line of the Walgamuth plant at Akron, Ind.

Coloring Ornamental Products by Special Process

The ornamental concrete products include a well diversified selection made from some 12 or 15 different molds. The coloring is accomplished by a special process applied by a machine equipped with a 60-cycle, single-phase, 110/220-volt electric motor, a double-compartment gun and a 12-ft. hose, and an insulated cable and plug for attachment to an electric light or power socket.

Coloring Material Shot On With Gun

The coloring material, which is applied under high pressure in a plastic form, is a commercially prepared mixture having portland cement as its base, and including carefully selected and graded aggregate. The mixture includes, in addition, mineral coloring matter and other chemical ingredients, ground to a high degree of fineness. This plastic coat, because of the method of its application (under high pressure), forms a tenacious bond with the surface upon which it is shot. The mixture hardens or cures in the same way as ordinary concrete or cement mortar.

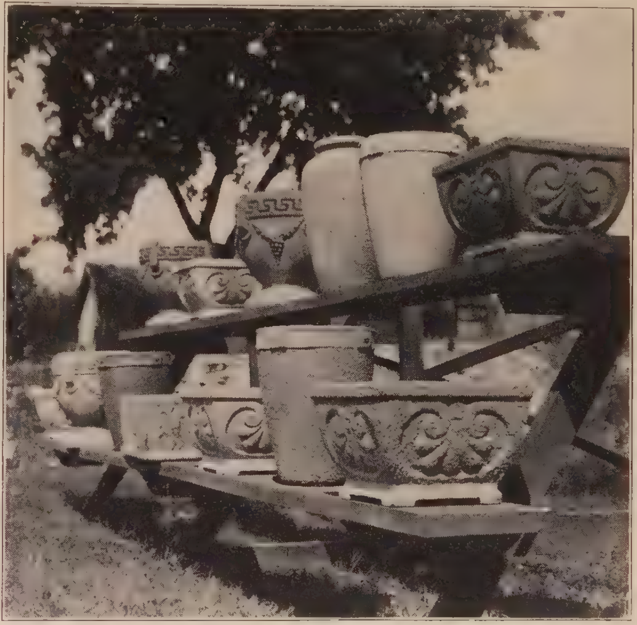


Figure 2. Outdoor display at plant demonstrates permanence of color in ornamental products

Application of Luster Coat

While the plaster coat of coloring material is still wet a luster coat is shot onto the surface from the second compartment of the gun, to give the product a lustrous gloss. This material, also a commercial product prepared especially for this purpose, is used in the form of transparent flakes.

Both the coloring material for the plastic coat and the flaky material for the lustrous finish are supplied in dry form, in 100-lb. sacks. The coloring material is mixed with water before being placed in the gun, but the flaky luster coat is shot on dry.

Establishing Market for Ornamental Products

When Mr. Walgamuth started the manufacture of ornamental concrete products in the spring of 1928 his first problem, aside from learning the technique of the coloring process, was that of establishing a market.

For this purpose he at first depended to a considerable extent on display advertising in local newspapers and on attractive displays at local fairs and other gatherings. His first display was at a county fair in Akron. Subsequent displays in which the same ornamental products were employed were placed at the county fair in Warsaw, and in Roann.

Testing Permanence of Color

The ornamental products employed in the public displays are shown in one of the illustrations (Figure 2). They now constitute a permanent outdoor display at the plant, where they serve the additional purpose of a test of color durability. This test has been continued for 3 years, and it can be said without qualification that the colors have an appearance of freshness equal to that of new products.

This collection of ornamental products was seldom used in special displays after the first year, since by that time the products installed around attractive homes and public buildings constituted far more effective advertisements. As a demonstration of color permanence, however, the display is expected to continue in service for many years to come.

Burial Vault Business in Fair Volume

The Walgamuth plant sells an average of about 100 concrete burial vaults annually. These are marketed in the usual way, through arrangements with undertakers whereby the latter obtain commissions on all sales made to their patrons. The vaults are colored in somewhat subdued tints, a feature which is believed to add to their marketability.

How Vaults Are Handled

Following the usual custom, the vaults are set in place by the manufacturer. The equipment employed in handling the vaults in the cemeteries includes a carriage mounted on wheels, to take the vault from the motor truck to the place of burial, and a portable 3-legged derrick equipped with block and tackle to lift and lower the vault into final position.

At the plant the vaults are handled with a block and tackle supported by an overhead trolley that operates on a track which in turn is supported near the peak of a series of A-frames.

Portable Concreting Outfit

As an added diversification of his business, Mr. Walgamuth does a certain class of contracting work, but not in competition with his contractor customers. He confines this phase of his work mainly to small contracts on farms, on which only a few yards of concrete are required. For this purpose he has mounted a ½-yd. Jaeger mixer on a 2-wheeled trailer. The trailer is hooked to a truck, which in turn carries the necessary aggregates, sacked cement and form lumber required for the small contract. This improvised outfit is driven to the place where the concreting is to be done, and usually the work is completed in the course of a few hours.

Acknowledgments

The molds with which the cast stone work is made, the coloring material that forms the plastic coat, the flaky material that forms the lustrous gloss, and the machine or "gun" with which the coloring material and the glossy finish are applied, are all manufactured and supplied by the Colorcrete Industries, Holland, Mich. CONCRETE is indebted to Fred Walgamuth, owner and manager of the products plant at Akron, for permission to publish this description of the manufacturing process and marketing methods.

Formulas for Use of Mineral Colors in Concrete

Formulas for the use of mineral colors in concrete work, covering six principal color effects with several shades of each, are given in a recently completed series of articles by E. T. Ellis, in the Cement Mill Section of CONCRETE.

These formulas should be considered mainly as a guide, or starting point, for it will be found that there is considerable variation in the intensity of the color effects produced by equal quantities of mineral colors from different sources. In each case the manufacturer should be consulted; and in all cases the exact amounts to be used can be determined by making up trial specimens of colored concrete one or two months in advance, so that the effect of the various proportions may be determined from well-hardened specimens.

The proportions, by weight, recommended by Mr. Ellis are given in the tables that follow.

FOR RED EFFECTS

	Pale Red	Medium Red	Dark Red
Portland cement	93	86	79
Ferric oxide	7	14	21

FOR BLACK EFFECTS

	Greyish Black	Medium Black	Carbon Black
Portland cement	95	90	85
Carbon black	5	10	15

FOR YELLOW EFFECTS

	Cream Yellow	Medium Yellow	Deep Rich Yellow
Portland cement	95	90	85
Barium chromate	5	10	15

FOR BLUE EFFECTS

	Pale Blue	Medium Blue	Dark Blue
Portland cement	93	86	79
Azure blue	7	14	21

FOR BROWN EFFECTS

	Pale Brown	Medium Brown	Dark Brown	Extra Deep Brown	Rich Red Brown
Portland cement	94	88	82	88	88
Manganese dioxide	3	6	9	8	4
Ferric oxide	2	4	6	2	6
Ferroso-ferric oxide	1	2	3	2	2

FOR GREEN EFFECTS

	Pale Green	Medium Green	Deep Rich Green
Portland cement	95	90	85
Chromic oxide	5	10	15

EDITORIAL

Strangling Highway Construction

THE manner in which the Illinois minimum wage law, recently declared unconstitutional by the state supreme court, has resulted in strangling highway construction and other public construction work is not in the least surprising. On the contrary, the operation of this law, which was in force for nearly four months during the very heart of the construction season of 1931, has added another sorry example to the long list of misguided efforts to cure economic ills with politics.

Ostensibly the law was designed to prevent excessive lowering of wages by contractors who might be tempted to take unfair advantage of the labor surplus. In its actual operation the law became mired in a bog because the various parties concerned could not agree on the point at which lowering of wages could be considered excessive. The net result was that millions of dollars of available highway construction funds have remained unexpended, and many communities in dire need of employment have been denied such employment at any wage scale.

Governmental action, when directed with intelligence and a sincere desire to accomplish constructive results, can play an important part in overcoming the difficulties with which the world is struggling. When such action is based on political expediency and the desire to favor a special group having selfish interests at heart, the outcome is often as disappointing as in the case of the Illinois minimum wage law.

Another Ten Thousand Miles

AGAIN the state and county highway departments of the nation have added the equivalent of more than 10,000 miles of 18-foot concrete roads to the highway system of this country. This accomplishment of the year just closed establishes a new record for concrete road construction, exceeding 1930 by several million square yards.

The construction of this great mileage is estimated to have given direct employment to 350,000 workmen, and indirect employment to many more.

This new record was not attained without difficulty, for throughout the greater part of 1931 our highway departments were subjected to pressure from all sides. On the one hand was the urge to provide employment through public construction. Against this demand was the clamor for relief from high taxes, and numerous attempts to divert highway funds to other governmental uses.

In spite of the heavy construction programs that held the attention of highway engineers, much has been accomplished during 1931 toward improving our methods and our knowledge of concrete. Experimental stretches of resurfaced concrete roads have been built with the view of studying the effectiveness of various types of resurfacing. Other tests have been conducted under actual service conditions in efforts to determine the relative value of various methods of curing. Still other stretches of road were built to try out a new method of compacting the concrete; or as a means of studying the performance of different types of transverse joints; or to test the comparative effect of vibrated concrete.

Tandem mixers have been tried out, to demonstrate their value in reducing costs by spreading the daily overhead charges over a greater yardage. Bulk cement is being used to an increasing extent, as a further means of trimming costs. High-early-strength cement has been successfully employed, especially in mountain regions, for the purpose of eliminating the cost and inconvenience of long detours.

And now, at the close of this year of progress in concrete highway construction, we find the highway departments of many states and counties putting forth every effort to speed up the construction of bridges and grade elimination structures, for the commendable purpose of providing employment in the winter season.

Contractors Find Outlet in Ready-Mixed Concrete

IT is entirely natural, and perhaps inevitable, that many progressive contractors should engage in the business of producing ready-mixed concrete.

This is a fortunate development for this young industry. To begin with, the contractor of the forward-looking type often found operating a ready-mixed concrete plant has an intimate acquaintance with the very practical problems involved in the making of concrete.

In the second place, a contractor is in a position to use a considerable part of the plant's production in his own contracting work. In fact, the desire to have ready-mixed concrete of dependable quality for his own construction contracts often provides the most powerful inducement to establish a central mixing plant.

The contractor knows, too, that the business of producing and delivering ready-mixed concrete requires ample capital as well as scientific knowledge of cement and concrete. To him a central mixing plant is concentrated and highly organized construction equipment. It supplies him with a natural outlet for the broadening of his activities.

PROGRESS—In a Page

Current activities in research, in matters pertaining to concrete and cement, as being carried on or completed by various organized groups.

Resurfacing and Salvaging of Existing Pavements

RESURFACING and salvaging of existing pavements is more expensive than new paving in numerous instances, according to the report of a committee of the City Officials' Division of the American Road Builders' Association, National Press Building, Washington, D. C. V. N. Taggett, city engineer, Niles, Mich., is chairman of the committee.

There are many instances, however, where the salvaging of existing pavements, either as a base or relaid, is a sound financial investment. For the resurfacing of old concrete pavements with concrete, the committee recommends that a reinforced slab be used, with a depth varying from 4 to 7 in., depending on the condition of the old pavement.

Much Work Under Way by A. S. T. M. Committee C-9

COMMITTEE C-9 on Concrete and Concrete Aggregate, one of the most active committees of the American Society for Testing Materials, has a number of studies and investigations under way. Among others are the following:

Studies of Designing and Proportioning of Concrete.—Analyzing the existing data on various theories of preparing concrete mixtures and of developing an adequate theory of design, including methods of proportioning. See preprint, Report of Committee C-9 for 1931 annual meeting.

Studies of Concrete Aggregates.—A study of the various properties of aggregates for concrete, including soundness, resistance to abrasion, absorption and influence of shape, fineness and soft particles on quality of concrete. See preprint, Report of Committee C-9 for 1931 annual meeting containing revised tentative specifications for concrete aggregates and new methods of test for structural strength of fine aggregate using constant water-cement-ratio mortar (C 87-31 T) and test for apparent specific gravity of coarse aggregates in a saturated condition (C 86-31 T).

Curing of Concrete.—Co-ordination and study of results of investigations of the curing of concrete, looking ultimately to recommended methods of practice or specifications for curing. Extensive report containing 5 specifications for curing portland-cement concrete, including curing with bituminous coverings, calcium chloride admixture, surface application of calcium chloride, and wet coverings. Also report on curing of portland-cement concrete with special reference to curing of pavement slabs containing "Digest of Available Information on the Use of Calcium Chloride for Curing Concrete"; also "Digest on Effect of Curing Methods on Strength of Concrete." See preprint, Report of Committee C-9 for 1931 annual meeting.

Workability of Concrete.—A study of the significance and methods of determining workability of concrete. See *Proceedings*, Vol. 29, Part I, p. 297 (1929).

Admixtures in Concrete (Committee C-9).—A general study of admixtures which may be added to concrete for the purpose of improving some of its properties. Progress report, see *Proceedings*, Vol. 29, Part I, p. 305 (1929), containing a summary of manufacturers' data concerning various commercial admixtures.

Permeability of Concrete.—Study of the literature followed by studies of various methods and apparatus. Investigation just started, see preprint, Report of Committee C-9 for 1931 annual meeting.

Conditions Affecting Durability of Concrete in Structures.—Study of the conditions under which concrete has not been durable. It will emphasize the precautions which must be taken to produce good concrete, whether in methods, material, or workmanship. For report on the examination of concrete structures in Ontario and Quebec together with observations and conclusions, see *Proceedings*, Vol. 30, Part I, p. 686 (1930).

Federal Specifications for Fillers in Asphaltic Concrete

A SPECIFICATION covering the use of portland cement, limestone dust and dolomite dust as the mineral filler in sheet asphalt or asphaltic concrete pavements has been adopted and promulgated by the Federal Specifications Board of the United States Bureau of Standards.

February 15, 1932, has been established as the mandatory date after which this specification is to constitute the purchase specification for all departments and independent establishments of the federal government.

Copies of the new specification, which is designated by the symbol SS-M-351, may be obtained at 5 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

A Financing Plan for County Highways

THE equitable distribution of highway funds between states, counties and cities is limited somewhat in the establishment of uniformity in the 48 states, 3,000 counties and many cities, by the variation in extent of improvements, population, wealth and laws. A plan of financing prepared for a middle-western state, by B. C. McCurdy, county highway superintendent of St. Clair County, Illinois, has been presented in a report of the American Road Builders' Association, National Press Building, Washington, D. C.

Copies of the plan may be obtained by addressing that association.

Mill Inspection of Reinforcing Steel

THE Committee on Inspection and Testing, of the Concrete Reinforcing Steel Institute, Tribune Tower, Chicago, Ill., has developed a standard specification covering the proper procedure for inspecting new billet reinforcing steel at mills. This procedure has been submitted to the National Engineering Inspection Association for study with the view of its possible adoption as the standard of that association.

Economical Form Construction in Brooklyn Subway

Use of Light-Weight Fibre Board Simplifies Erection and Stripping—Bend Forms Into Arched Surface—Material Re-Used Nine to Fourteen Times

The second of this series of articles on the use of wood-fibre board in concrete form work describes and illustrates the use of this type in the construction of a subway.

Later articles, each complete in itself, will cover the use of similar forming materials in the construction of a building, a monolithic concrete sewer, and a concrete bridge.—The Editors.

ONE of the finest examples of form finished concrete surfaces may be found in a recently completed section of Interborough Subway, in Brooklyn, New York. This section is designated by the Board of Transportation as Section No. 9, and ends at Fourth Avenue.

The general contract was awarded to Thompson-Leopold & Fredburn, who in turn subcontracted the concrete work to Campbell & Devine, of Boston. Campbell & Devine chose, and made themselves responsible for, a new and unique system of forming subway arches.

Type of Construction

This section of subway consists of a series of continuous rows of segmental arches, spanning between heavy plate girders, fireproofed with concrete. The arches were framed between 18-in. I-beams incased in concrete. Figure 1 shows a cross-section of the arches, with one of the forming systems that was proposed.

The span of the segmental arch is 5 ft., with an 8-in. rise. The depth of the concrete slab at the crown of the arch is 5 in. The depth of the slab at the spring line is 10½ in. The concrete beam is formed by incasing the lower part of the 18-in. I-beam the full width of its flange. It is 9½ in. deep, and 11½ in. wide.

Points on Form Construction

Figure 2 will furnish a clear picture of the type of forming that was used. Heavy gauge wires were looped over the top flange of the 18-in. I-beams, on about 8-in. centers, and used as hangers to carry 2 by 4-in. joists. Figure 2 clearly shows the manner in which the arch forms were constructed.

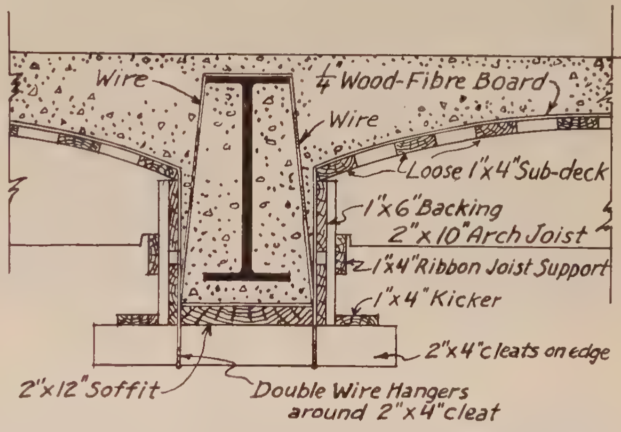


Figure 2. Detailed cross-section of wood-fibre board forms in roof of subway

The 2 by 4-in. joists were hung with their tops about 4 in. below the beam flange, to allow for a 2 by 12-in. soffit center, and the required depth of concrete fireproofing. Joist sides were held in place at the bottom with a 1 by 4-in. wood "kicker," nailed to the joist and running parallel to the beam.

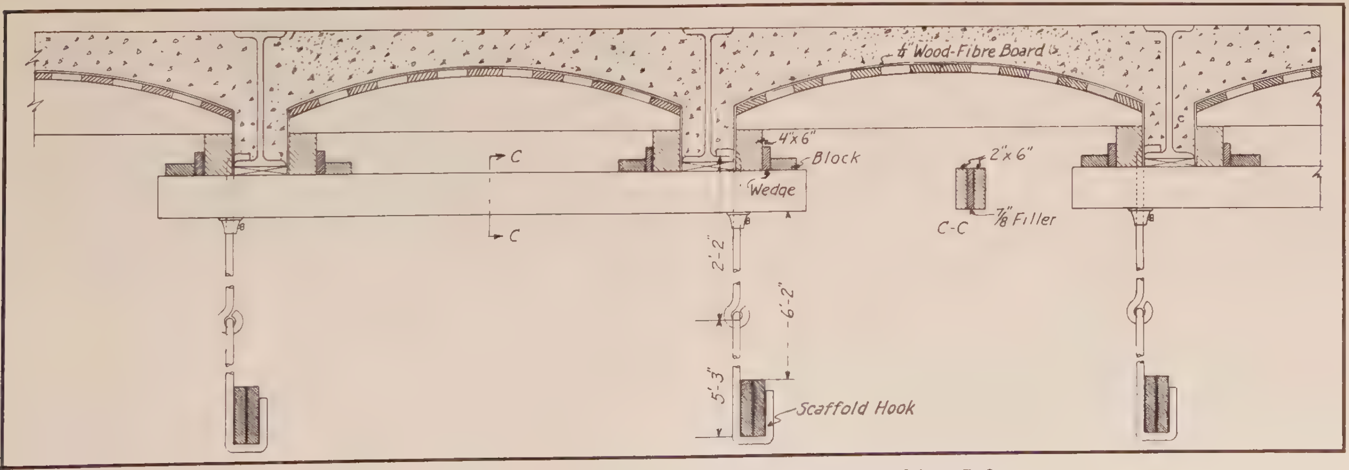


Figure 1. Typical form work in arched roof of Brooklyn Subway

The concrete beam sides were constructed of a ¼-in. wood-fibre board, with a light skeleton frame of 1 by 4-in. material running laterally the length of the beam side. This wood-fibre board is manufactured under a special process, and treated under process at the plant, to make it particularly adaptable to heavy concrete form usage.

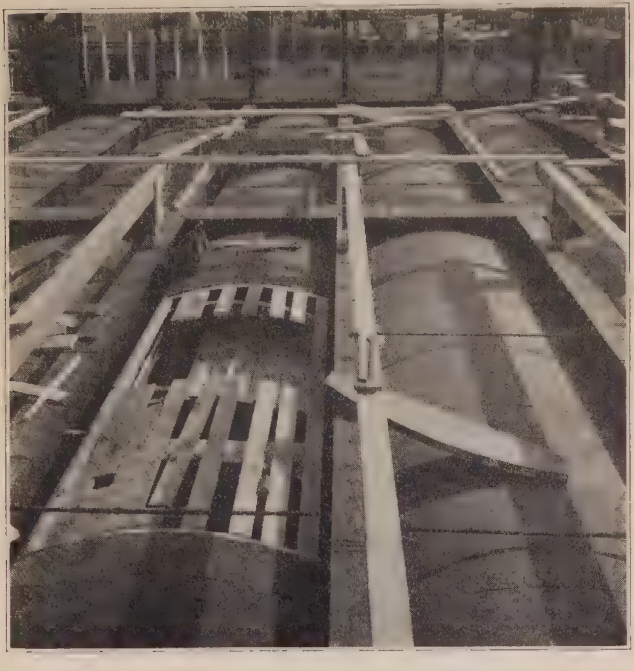


Figure 3. Form work in place for concreting roof of subway

The beam sides are extremely light in weight, and easy to handle. The entire made-up form weighs about 4½ lb. per sq. ft.

The construction of the arch is simplicity itself. A 2 by 10-in. curved wood template is cut out to fit the curve of the arch, and notched at each end. This piece rests on a 1 by 4-in. ribbon nailed to the beam side, the notched ends acting as a "kicker" for the center of the beam side. These templates are thrown into place rapidly about every 30 in., with no particular care as to centering. Along each edge of the arch, a 1-by-4 is set the full length of the arch span, and nailed to each wood template. Other 1-by-4's are then thrown in and centered rapidly at random, about 4 to 5 in. apart. If short lengths of 1-by-4 are on the job, they can be staggered over the templates, to save time and waste of cutting.

Over this skeleton frame, fibre board ¼ in. thick, already cut to size, is laid and tacked lightly along each edge of the arch, and on alternate 1 by 4-in. ribs. The arch form is now ready for placing concrete.

Figure 3 shows the arch already framed to receive the concrete. The open section of arch framing in the foreground carries sub-decking for a manhole outlet. In the background, on this same arch span, a similar opening has been completely framed, and the manhole is in place.

Simplicity of Stripping

The ease of stripping this form can be readily appreciated. The 1 by 4-in. ribbons, nailed to the joist sides, are pulled and the templates and the 1 by 4-in. supporting ribs fall to the scaffolding. The fibre boards are easily stripped. Following this, the 1 by 4-in. "kicker" is pulled, and the beam sides are stripped intact. The entire forming system is ready to set up on the next available arch span.

There is little or no wastage to either the fibre board or the supporting lumber. The lumber is protected from moisture. The fibre board may be cleaned, when dry, with a scrubbing brush or cloth. In fact the manufacturers of this board recommend that it be wiped down with a cheap oil or distillate between re-uses, to keep the face of the board in best condition.

Column Forms

Most of the columns in this contract were heavy, latticed channels, incased in concrete. Figure 4 shows a number of finished surface columns, and the bare outer column with the concrete form base in place.

Finished concrete columns in this work were formed with ¼-in. fibre board, backed up with a skeleton frame of 1 by 4-in. stock. Wood chamfer strips were tacked in the corners to give the finished columns beveled corners.

Economy of Using Fibre Board

The fibre board on this work was re-used from nine to fourteen times, which reduced its original cost to a negligible factor. The operation of cleaning the board was simple, quick and inexpensive. This was equally true of its maintenance. It was found adaptable to both the flat and curved surfaces.

The character of the construction afforded the form sections or panels repeated use, with very little additional cutting. Inasmuch as the supporting lumber for the fibre board was at all times protected from moisture, its salvage value from one use to another was practically 100 per cent.

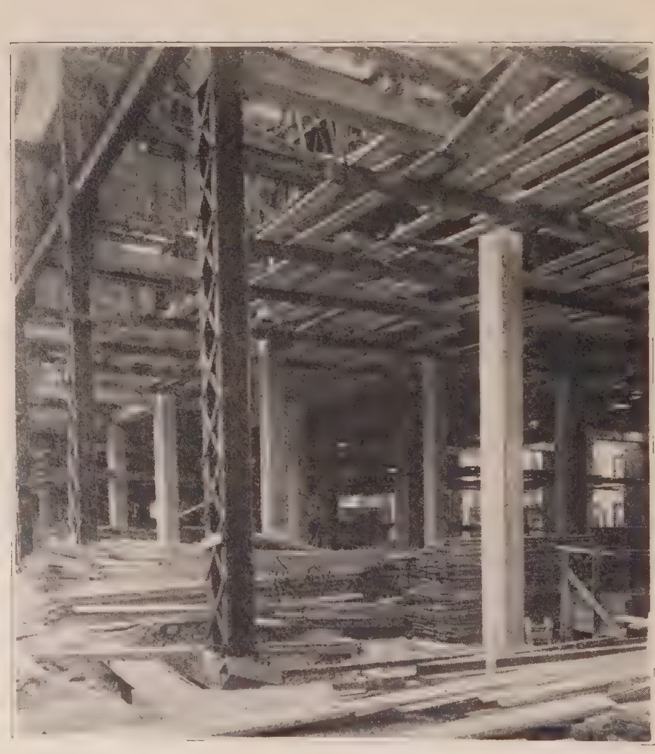


Figure 4. Finished columns and bare outer column with concrete form base in place

The forms were light and easy to handle, and the construction was simple. As previously stated, it was easily

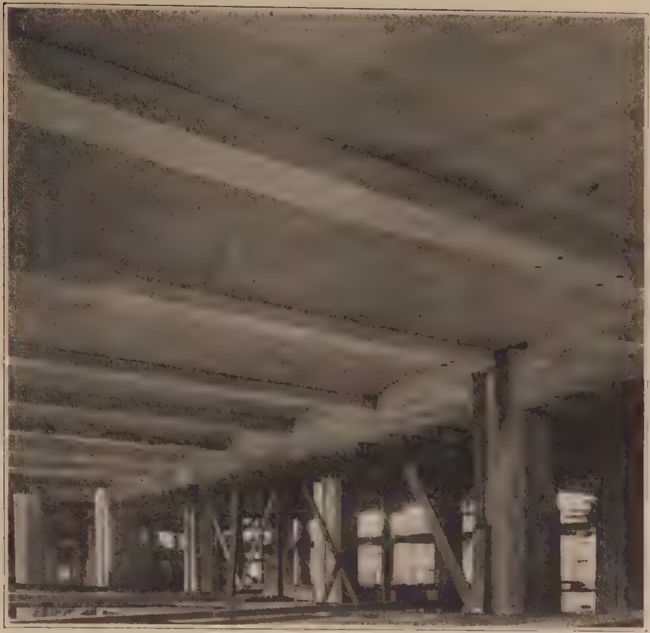


Figure 5. Smoothly finished ceiling obtained with fibre board

erected and quickly stripped. A concrete surface was produced that entailed little or no expense in hand finishing. It may be readily appreciated that here was a very economical forming system.

The board is made from clear wood fibres, closely felted together, without the use of any chemicals or foreign binders. After the board is manufactured, it is specially processed to make it strong, dense and rugged.

The boards are manufactured and delivered in standard size sheets, 4 by 12 ft. in dimensions. The board used in the construction previously discussed was ¼ in. thick. The fibre board is also manufactured in thicknesses of ⅛, 3/16, and 5/16 in.

The weights of the fibre board of the various thicknesses are as follows:

Thickness	Weight per 1,000 sq. ft., lb.
⅛ in.	773
3/16 in.	1,093
¼ in.	1,380
5/16 in.	1,620

This specially processed board has a specific gravity of 1.140, which is greater than the specific gravity of northern hard maple. It has an average tensile strength of 7,000 lb. per sq. in., a working stress of 1,200 lb. per sq. in., and a modulus of rupture of 13,000 lb. per sq. in. Its resistance to abrasion is more than twice that of pine form lumber.

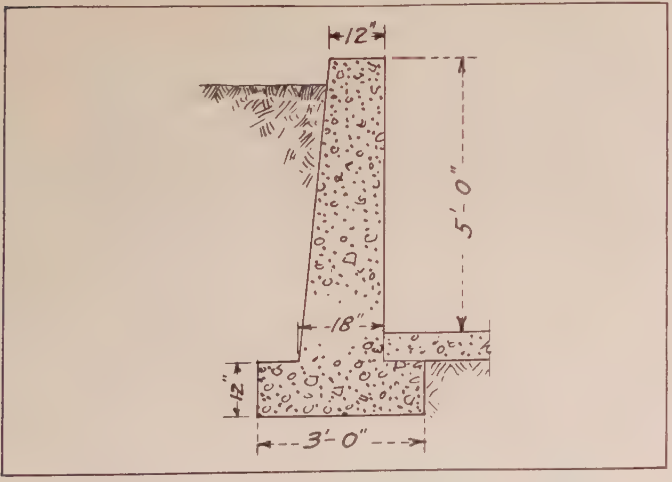
Durable Concrete 21 Years Ago

Concrete Placing Methods Would Be Good Practice Today—Wall Remains Watertight

By FRANK FARACO

Contractor, Oyster Bay, Long Island, N. Y.

TWENTY-ONE years ago I took my first concrete contract, for a reservoir. I had built several concrete foundations and wondered what I would have to do to make the reservoir watertight. The precautions I took to get a good job are practically the same as those recommended by the Portland Cement Association today.



Cross-section of concrete wall of reservoir built 21 years ago

The reservoir was to be 20 by 20 ft. in plan and 5 ft. deep. My design of the wall is shown in the sketch. In spite of the absence of reinforcement the tank has not shown a crack or any seepage since it was built.

Exposed to Severe Weather

The ability of this concrete to withstand severe weather conditions on a hilltop near Oyster Bay, Long Island, is due to care in placing and the control of water in mixing.

We used a 1:2:4 mix with just enough water to make it plastic. It was mixed and placed by hand. Hand tampers packed it in place. After each day's concreting one man was left to rake off the top when the concrete started to set. Each morning we brushed off the top and applied a 1:2 mixture of sand-cement grout. Care was used in measuring the sand and gravel for each batch. Sand was carefully screened before mixing. These materials were luckily well graded.

No Repairs Needed

The owner has used this tank continually for 21 years, and during that time no repairs have been made. This job has been a great sales help for me in obtaining swimming pool work, for during the last two years I have built ten pools of various sizes.

Structural Design Charts

The January issue of CONCRETE does not include a chapter in the series entitled "Cutting Corners in Concrete Structural Design," by J. R. Goetz.

Publication of these charts and formulas will, however, be resumed in an early issue.

New Chart Locates U-Stirrups in Reinforced Concrete Beams

Japanese Application of Germundsson Chart Explained by Author—Concrete Assumed as Taking Third of End Shear

By K. KAWAI
No. 23, Miyazato, Nakano-machi, Tokyo, Japan

THE chart for locating U-stirrups described in CONCRETE of May, 1931, by T. Germundsson is of great practical value. I have tried the Japanese application of the chart and have made some improvement upon it. Some points that have to do with the building code of Japan are as follows:

Shearing stress for steel reinforcement[1] ....750 kg/cm^2

Shearing stress for the surface crossing the main bars of reinforced concrete beams.... 9 kg/cm^2

Stirrups must be located according to the distribution of the shearing stress, and the spacing between them must not exceed ⅔ of the depth of beams.

In Japan, for the general calculation of stirrups the shearing stress is used instead of the tensile stress. As the uniform load is generally used, the formula is—

$$a_t = \frac{M}{f_t\, j} = \frac{wL^2}{12}\cdot\frac{100}{f_t\, j} \quad \therefore N = \frac{VL}{4a_s\, f_s\, j}\times\left(\frac{2}{3}\right)^2$$

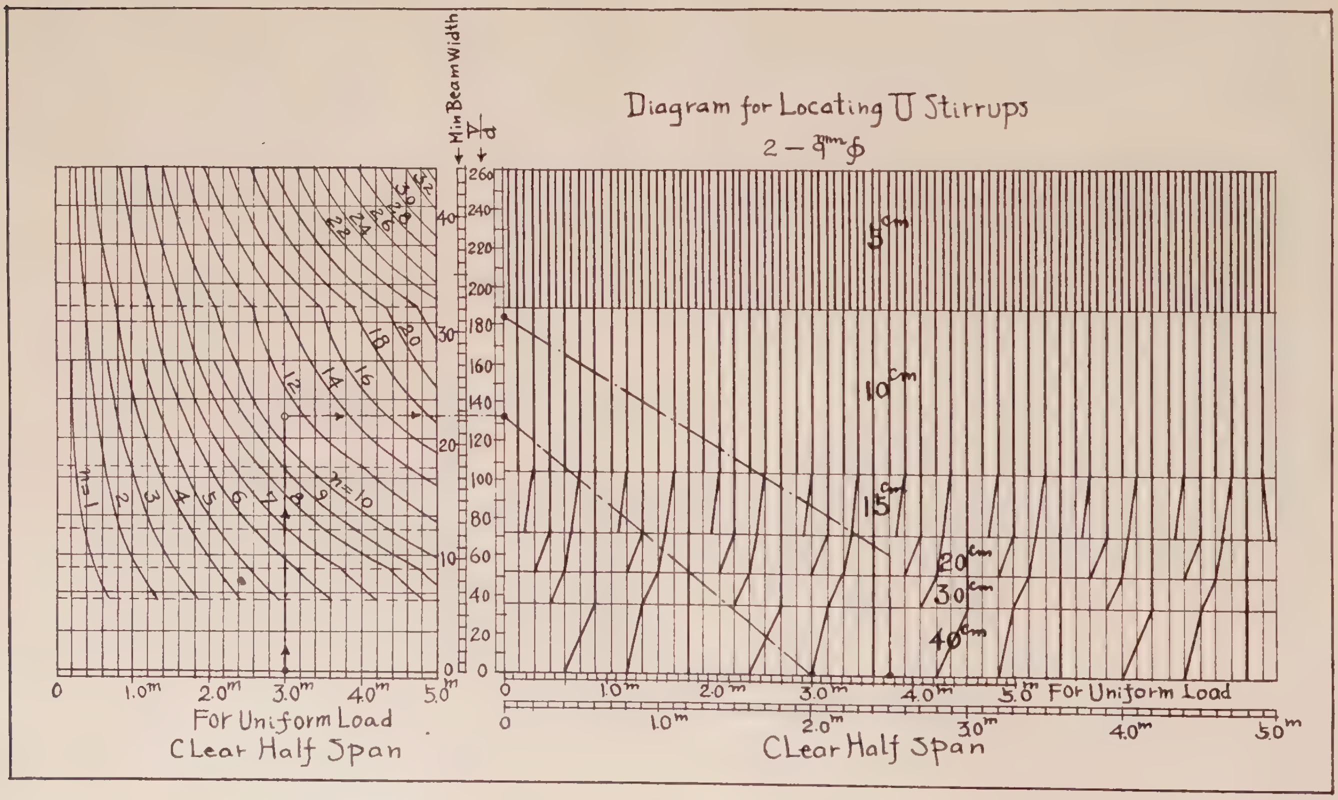
$$= \frac{\dfrac{wL}{2}\times L\times 100}{4a_s j\,\dfrac{2}{3}f_t}\times\left(\frac{2}{3}\right)^2$$

$$= \frac{wL^2}{12}\times\frac{1}{a_s}\times\frac{100}{f_t j}$$

$$\therefore N = \frac{a_t}{a_s}$$

If the area for tensile reinforcement with the moment of $\frac{wL}{12}$ is the total area of the stirrups required for the half span of a beam, we can easily find the number of stirrups. Then we scarcely need to take the trouble of finding it with the help of the chart; but with other loading we need the chart.

When the shearing stress is 750*kg/cm*^{2}, and only ⅔ of



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[1] For comparison, 1 kg/cm^2 = 14.223 lb. per sq. in.

the shear value is assigned to the stirrups, the formula will be—

$$S = \frac{f_s \cdot Av}{v \cdot b} = \frac{f_s \cdot Av}{\frac{V}{d} \times \frac{2}{3} \times \frac{8}{7}} = \frac{f_s \times \frac{3}{2} \times Av}{\frac{V}{d} \times \frac{8}{7}}$$

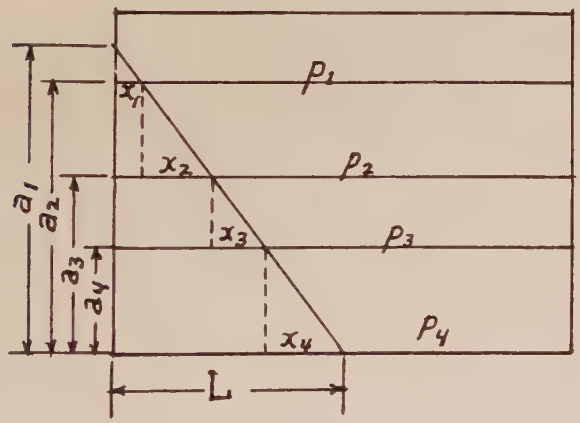
$$= \frac{1125 \times 7Av}{\frac{V}{d} \times 8} = \frac{Av}{\frac{V}{d}} \times 984$$

using 2 — $9^m\phi$ $$S = \frac{1252}{\frac{V}{d}}$$

Then we can find the chart on the right side by the same method taken by Mr. Germundsson. But in uniform loading, the stirrups obtained by the above formula have ⅔ of the shear assigned to them at both ends of a beam. At other points of the span, as in the case of the ends, if we reduce the total shear at any point by ⅓ of the end shear, on the assumption that the concrete takes this third, we must shorten the span scale to ⅔ of the actual span. This is shown in the upper horizontal scale.

Now when the number of stirrups is found by the formula, we further use the chart on the left in order to obtain their location. The method is described below.

If we draw a straight line with a given span and $\frac{V}{d}$ in the chart on the right side, we have the following result by geometrical operation, as illustrated in the small diagram.



$$x_1 = \frac{L}{a_1}(a_1 - a_2) \quad \therefore n_1 = \frac{x_1}{p_1} = \frac{L}{p_1 a_1}(a_1 - a_2)$$

$$x_2 = \frac{L}{a_1}(a_2 - a_3) \quad \therefore n_2 = \frac{x_2}{p_2} = \frac{L}{p_2 a_1}(a_2 - a_3)$$

$$\therefore N = (n_1 + n_2 \ldots) =$$

$$\frac{L}{a_1}\left\{\frac{1}{p_1}(a_1 - a_2) + \frac{1}{p_2}(a_2 - a_3) \ldots\ldots\ldots\right\}$$

$$= \frac{L}{a_1}\left\{\frac{a_1}{p_1} + c\right\}$$

$$\therefore a_1 = \frac{c}{\left(\frac{N}{L} - \frac{1}{p_1}\right)},$$

where $c =$ a constant $a_1, a_2 \ldots$ in the same scale of L.

If we suppose a span and number of stirrups we can obtain the value a_1—that is, V/d. Thus we can get the same result from other pitch bands, so that we can have the group of curves shown in the chart on the left side by connecting the points which correspond to the same number of stirrups as well as the span. In this way we have succeeded in drawing the chart for any cases of ⅔ of the shearing stress assigned to stirrups.

The relation between the width b and V/d at the end will be as follows, if the maximum shearing stress is limited to $9 kg/cm^2$, according to the building code of Japan:

$$\frac{V}{b \cdot j \cdot d} \times b = 9 \times b$$

$$\frac{V}{d} \times \frac{8}{7 \times 9} = b$$

Thus we can get the minimum width of the beam shown in the middle scale of the chart.

Workability Found Necessary for Paving Concrete

Arlington Experimental Road Proves Inadequacy of Laboratory Determinations—Revision of Slump Requirements Needed

By **WARREN C. BRUCE**
Chemical Engineer, Barnsdall-Tripoli Co., St. Louis, Mo.

THE August (1931) number of *Public Roads*, published by the U. S. Bureau of Public Roads, Washington, D. C., devotes the entire issue to "Studies of Paving Concrete," by F. H. Jackson and W. H. Kellermann. This paper, which was abstracted in the November (1931) issue of CONCRETE, pages 17-18, was presented at the American Society for Testing Materials convention this past June in Chicago and created quite a stir, as the conclusions are at variance with previous conclusions of many authorities, although they corroborated conclusions of what to date might be called the minority opinion of concrete technicians.

Workability an Important Factor

The most important point brought out by the authors is that the strength of concrete in the slab depends upon the workability and uniformity as well as upon the water-cement ratio. They found that workability on the job is necessary, because when concrete ceases to have field workability, the strength decreases with decrease in the water-cement ratio, even though the concrete is workable by laboratory standards. This was caused by honeycombing produced through lack of uniformity, which in turn was caused by lack of field workability. This does not necessarily mean that the water-cement ratio is contradicted, but it does bring out the important fact that in applying the water-cement ratio theory it must be confined to mixes within the range of field workability rather than to mixes within the range of laboratory flowability and workability. It should be noted that the conclusions and recommendations of the authors all revolve around the fact that workability is necessary.

Laboratory Can Not Determine Field Workability

Another important point brought out in this paper is that field workability cannot be determined by any laboratory method yet discovered, and that concrete which is workable by laboratory standards has been found unworkable in the field, and vice versa. Many engineers understand the benefits to be derived from workability in structural concrete where it is necessary because of thin sections, heavy reinforcing, spouting and other requirements; but, on the other hand, many engineers feel that workability in paving concrete is not necessary because the concrete is merely dropped into place, spread out, tamped, and finished. It is to the credit of the Bureau of Public Roads that they, after an extensive and painstaking series of tests, have properly correlated the large amount of data necessary to prove that workability is also necessary for paving concrete.

In this paper the Bureau of Public Roads also points out that the strength and durability of field concrete cannot be predicted from the strengths exhibited by test cylinders, because no matter how stiff or harsh the mix is, it is possible to place the concrete thoroughly and uniformly in a test cylinder, whereas the same mix can not be thoroughly and uniformly placed in the field. It has been common practice to assume that the durability of the structure would vary directly with the strength exhibited by the test cylinder. The authors feel that such an assumption is incorrect for the same reasons mentioned above; namely, the actual strength and amount of honeycombing in the actual structure does not show up on the test cylinder. To prove this point, they are going to continue their tests along similar lines to determine the relation between honeycomb, field workability, water-cement ratio, strength, and frost action, on the one hand, as compared with laboratory workability and test cylinder strengths on the other hand. It is hoped that, in continuing their tests, the Bureau of Public Roads will also investigate the effect of siliceous admixtures on these factors and thereby make their investigation complete.

All the above points have been repeatedly stressed for many years by the various siliceous admixture producers and also by certain concrete technicians, but none of these parties have had the facilities to prove these facts definitely in connection with paving, as has the Bureau of Public Roads. There are, however, numerous references in the literature where these facts have been proved regarding structural concrete, but unfortunately sufficient publicity has not been given to these conclusions and there are still a few engineers who do not fully appreciate the necessity of workability, even in structural concrete.

As a result of previous conclusions regarding paving concrete, most of which were either based on laboratory tests or upon field tests in which all the variables were not controlled, many state, county and municipal highway departments have adopted specifications requiring strict adherence to the water-cement ratio theory, and have evolved specifications based on laboratory standards with the result that the slump was required to be not greater than 2 in. It should be noted in the conclusions and recommendations of the authors that the use of paving mixes showing less than 2 in. slump should be revised to provide that the slump be from 2 to 3 in. and that all specifications covering concrete for pavements contain a definite requirement covering consistency to provide a workable mix to insure uniformity.

Applying these conclusions to field conditions, we arrive at the following facts: The aggregates available in many localities are such that it is difficult and in some cases impossible to grade the aggregates to produce a workable mix and still adhere to a sufficiently low water-cement ratio to maintain the strength. Consequently, in these cases it is necessary either to add water in order to maintain proper consistency, which of course sacrifices strength, or to specify a low water factor siliceous admixture without the use of additional water, and therefore maintain both the strength and the workability.

Institute and Masonry Association Programs Dovetail

One of the fullest programs the American Concrete Institute has yet launched will get under way at Washington, D. C., on March 1, and continue to the 4th. The Concrete Masonry Association will also meet there on March 1 and 2, its session being planned to dovetail with those of the Institute in which products manufacturers are interested.

All sessions will be held at the Capitol City's Wardman Park Hotel, with registration beginning on the morning of Tuesday, March 1. The first and second technical sessions of the A. C. I. will be held Tuesday afternoon and evening, the Masonry association's program being held separately at the same time.

On Wednesday morning, March 2, the Institute's third session will be devoted largely to concrete masonry, particularly to considerations growing out of investigations of concrete masonry wall stability. These themes will then be carried through to their practical, commercial conclusions by the association in the afternoon of the same day, the Institute meanwhile having an open period for a choice of several inspection or sightseeing trips.

association in the afternoon of the same day, the Institute meanwhile having an open period for a choice of several inspection or sightseeing trips.

Fireproofing of Steel-Framed Building

Fireproofing steel frames of buildings with cinder concrete has become a highly specialized and well standardized construction practice in New York City.

This practice will be described and illustrated in a series of three articles starting in the February issue of "Concrete."

The author of these articles is an experienced construction superintendent who made a personal investigation of the methods employed. He will tell the story directly from his notes and sketches.

Produce Ready-Mixed Concrete With Complete Automatic Control

Brooklyn Contractor Enters Ready-Mixed Concrete Field—"Electric Eye" Controls Automatic Proportioning Equipment — Cement and Aggregates Unloaded from Barges

ONE of the important phases in the development of the growing ready-mixed concrete industry is seen in the number of contracting concerns that have entered this field.

It is natural and logical that contractors should be one of the principal groups to take over this new industry. To begin with, they have an intimate acquaintance with the very practical problems involved in the making of concrete. Another point in their favor is that they are in a position to use a part of their own production. In fact, quite often the factor that leads them into the business of producing ready-mixed concrete is the desire to have it for their own contracts.

Brooklyn Contractor Enters Field

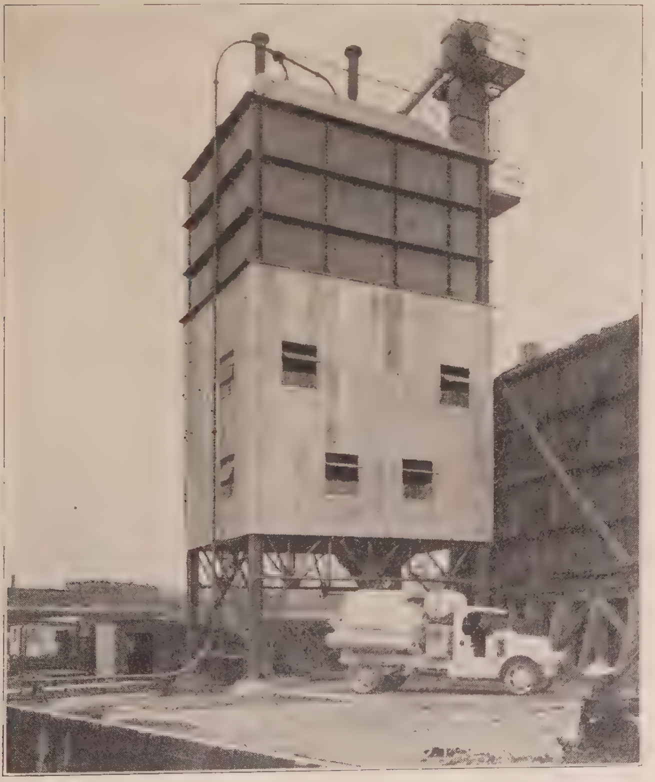


Figure 1. A compact and completely equipped plant for supplying ready-mixed concrete

One of the most recent additions to the list of contractors in the field of ready-mixed concrete is the Cranford Company, of Brooklyn, who for many years have specialized in the construction of street and highway pavements, subways, retaining walls, foundations, and related structures. The concern has been a pioneer in this type of construction, for they claim to have laid the first asphalt pavement in Brooklyn. The founder of the firm, J. P. Cranford, in conjunction with N. B. Abbott, of Columbus, Ohio, likewise claims to have placed the first asphalt street pavement in the United States.

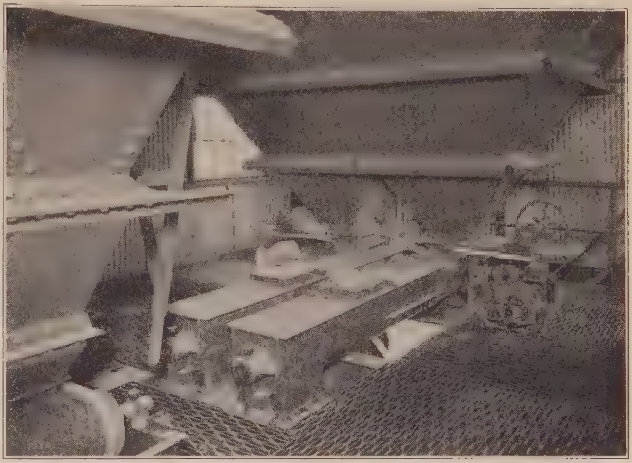


Figure 2. Two screw feeders draw cement from storage bins above, and deliver it to cement weigh-hopper beneath

Their latest piece of pioneering is a new ready-mixed concrete plant to produce concrete mixtures of uniform proportion and guaranteed strength. The plant is the transit-mix type, the batches being delivered to the trucks in dry form, and mixed by the trucks en route.

As shown in Figure 1, the plant is a compact unit operated in connection with the Cranford Company material supply yard. Raw materials—sand, aggregate and cement—are received in barges, unloaded mechanically and stored in overhead bins for use as needed. The cement is pumped from the barge to the overhead storage bin through the pipe seen against the left of the structure. Sand and gravel are unloaded by a crane and clamshell bucket and elevated to storage by the vertical bucket elevator at the right side of the structure.

The concrete ingredients are proportioned entirely by weight and are discharged as a dry mix to transit-mixing trucks for delivery to the various jobs. A fleet of 4½-yard trucks is operated. These consist of Jaeger mixing bodies on Mack chassis. Practically the entire output is sold for highway and subway jobs in the Brooklyn area.

Electric Control System

Several special features make this a unique plant in the ready-mixed concrete business. Perhaps the outstanding feature of the plant, which was designed and equipped by the Stephens-Adamson Manufacturing Co., of Aurora, Ill., is the automatic electrical control system, including the use of the new photo-electric cell commonly nicknamed the "electric eye."

The control system, also designed by the Stephens-Adamson organization, centers about a control panel from which one man can operate every unit in the proportioning plant.

The panel has control buttons for each conveyor, feeder and dump gate. In addition, each control has pilot lights to show the operator just what is happening to that particular unit. The controls are interlocked to insure the proper starting sequence and to avoid flooding any one unit.

Weighing and Proportioning Equipment Is Automatic

The weighing and proportioning is particularly interesting, since the Cranford plant is the first to use photo-electric cells on dial scales to insure uniformity and eliminate the human element. Two Toledo dial scales are used —one for aggregate and sand, and another for cement. Each scale is fitted with an "electric eye" which instantaneously stops the feeder for each material when the pointer swings past the proper weight.

Once the control button starts the feeder for any material, the action is entirely automatic. The scale pointer, on reaching the predetermined weight, intercepts the light that shines into the photo cell. The cell in turn trips a relay and stops the flow of material instantly. There is no guesswork on the part of the operator and no chance for over or short weights in any ingredients.

Figur 3. Sand and gravel are fed, one at a time, from overhead storage bins to weigh-hoppers beneath, by two belt feeders

Unloading the Barges

Sand and gravel are unloaded by a clamshell bucket on to a belt conveyor to yard storage bins at a rate of 200 tons per hour, or into a 10-foot square receiving hopper for the concrete proportioning plant at a rate of 100 tons per hour. Ordinarily the material is unloaded to yard storage and reclaimed by a belt conveyor to the proportioning plant receiving hopper as needed. A belt feeder and a bucket elevator elevate the material to a 4-compartment overhead bin beside the cement storage. Material can be discharged into any of the four compartments.

A warning system tells the operator when any bin is reaching its capacity load. As the material nears the top, a swinging paddle sounds an alarm horn in the control room. The operator then knows that he has just enough room left to hold the load already on his conveyor and elevator.

The Soul of the Plant

Of course, the body and soul of the plant is the batching and proportioning of the materials from the storage bins. Cement can be drawn from the two cement compartments by two screw feeders driven by motors equipped with solenoid brakes for instantaneous stopping. Each feeder has a triple-thread screw to give a slow, continuous flow of cement, which is collected in a separate weigh hopper fitted with a dial scale and photo cell control. An electrically controlled dump gate allows the operator to discharge the weighed charge of cement into the collecting hopper by simply pushing a button.

Sand and gravel are fed one at a time to another weigh hopper by either of two belt feeders driven by motors. The feeders deliver so steadily and so uniformly that the material in suspension is extremely small and can be gauged accurately. These feeders are controlled by a scale and photo cell, which can be set for the two charges, one of sand and a second charge of gravel. A second electrically operated dump gate in this weigh hopper permits the operator to discharge into the collecting hopper with the cement.

Acknowledgments

As previously stated, the Stephens-Adamson Manufacturing Co. designed and equipped the Cranford Company plant, and these manufacturers supplied all conveyors, buckets and other features of mechanical equipment. The designers of the plant supplied General Electric Co. motors and electric equipment throughout, and the scales were supplied by the Toledo Scale Co.

Hoover Dam Mixer Capacity 112 Cubic Feet

The largest-mixer record is now claimed by the first of four units now being built at Milwaukee for use in the construction of Hoover Dam. The mixer takes a charge of 112 cu. ft. of aggregate, weighing over 40,000 lb.

Specifications require stones up to nine inches in diameter, but the unit can actually take them up to twenty inches. It is hydraulically operated, by one man.

~ PERSONALS ~

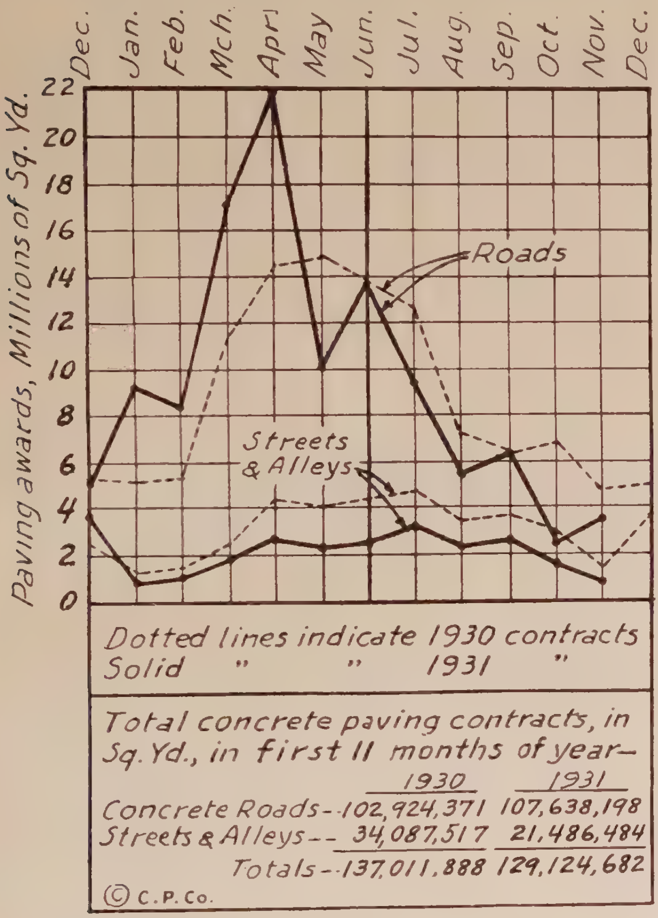
Raymond C. Briant has been appointed to take charge of research work contemplated under the fellowship recently established at the Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Pa., by the Green Bag Portland Cement Co. Mr. Briant has been engaged in cement research at the U. S. Bureau of Standards, Washington, D. C.

Concrete Road Construction to Make New Record

Low Yardage of Street Paving Brings Total Well Below Previous Year

With concrete highway construction contracts for the first 11 months of 1931 almost equal to the figures for the entire year of 1930, it seems certain that a new record will have been established when the December reports are in. The increase over the previous year is likely to be around 4 million square yards.

Concrete street and alley paving in 1931 suffers by comparison with 1930, the total for 11 months being nearly 13 million square yards below the corresponding period of 1930. This, as the chart shows, brings total concrete paving contracts, including roads, streets and alleys, about 8 million square yards below the first eleven months of 1930.



Total concrete paving contracts, in Sq. Yd., in first 11 months of year—

	1930	1931
Concrete Roads	102,924,371	107,638,198
Streets & Alleys	34,087,517	21,486,484
Totals	137,011,888	129,124,682

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Many state highway departments have awarded an unusual number of contracts for bridges, culverts and grade elimination structures, to be constructed during this winter.

The Onerous Duties of a County Road Inspector

A man whose business requires him to call on public officials in charge of highway construction has learned what county road inspectors are supposed to do—or, at least, what the public *thinks* they are supposed to do.

"On a hot day in early October," he writes us, "I had an hour to kill in waiting for a man I was to call on in White Plains, N. Y. I drove to the outskirts and parked under a shady tree, and with my coat off I settled down into a comfortably lounging position and read the paper. Some road construction was under way a hundred yards or so to my right, but since I had seen the work earlier in the day I now paid no attention to it.

"Presently, up drove a smart car containing two men, one of whom hailed me. 'Are you the county road inspector?' he inquired.

"My whole attitude had been that of complete absorption in the newspaper and the query struck my fancy as a sad reflection on the character of service generally accepted as being performed by those civic officials known as road inspectors. With a laugh I assured the stranger that I was *not* the county road inspector. Smiling somewhat wryly, he drove off to continue the search elsewhere."

Undoubtedly the man in the smart car got his idea of a road inspector's duties from some previous experience with an inspector of some kind. The leisure-loving road inspector still exists, but probably not in the highway department of Westchester County.

Milwaukee Convention City of A. G. C.

The thirteenth annual convention of the Associated General Contractors of America will be held at Milwaukee, Wis., on January 18 to 21. Headquarters will be at the Schroeder Hotel.

Coming Conventions

January 9-15—American Road Builders Association, twenty-ninth annual convention and road show. Municipal Airport Building, Detroit, Mich.

January 18-21—Associated General Contractors of America, thirteenth annual convention. Schroeder Hotel, Milwaukee, Wis.

January 19-22—National Crushed Stone Association, fifteenth annual convention. William Penn Hotel, Pittsburgh, Pa.

January 20-22—American Society of Civil Engineers, annual meeting. New York City.

January 25-26—National Ready-Mixed Concrete Association, second annual convention, William Penn Hotel, Pittsburgh, Pa.

January 27-29—National Sand and Gravel Association, sixteenth annual convention, William Penn Hotel, Pittsburgh, Pa.

February 1-2—American Concrete Pipe Association, twenty-fifth annual convention. Edgewater Beach Hotel, Chicago, Ill.

March 1-2—Concrete Masonry Association, annual meeting. Wardman Park Hotel, Washington, D. C.

March 1-4—American Concrete Institute, twenty-eighth annual convention. Wardman Park Hotel, Washington, D. C.

HOW TO DO IT

✦ Questions and Answers ✦
Consultation and Comment

A department devoted to the solution of problems encountered in concrete work. Readers are welcome to add to or improve upon the suggestions printed and to submit their views for possible publication.

Is It Necessary to Heat Coarse Aggregate?

We are placing some concrete in this moderately cold weather. We are heating the water and the sand, but the owner's engineer insists that we heat the gravel also.

The layout is such that heating the gravel will add considerable expense. In your opinion is it necessary to heat the coarse aggregate, when both the sand and the water are heated?—B. M. J., Indianapolis, Ind.

Your attention is invited to the abstract of an article published in the February (1931) issue of CONCRETE, pages 35-38, by I. E. Burks and G. D. Durham. These engineers, both of whom have had much experience in placing concrete in winter in Canada and the colder sections of the United States, assert that when the mixing water is heated to a temperature of 180 or 200 deg. F., that alone is sufficient for temperatures down to 15 deg. above zero F.

If, in addition to heating the water, the sand is heated to a temperature of 80 deg. F. or thereabouts, and a 1-in. steam jet is directed into the mixer, the heating is sufficient for temperatures down to 40 deg. below zero F.

The engineers mentioned express the opinion that it is a waste of time and money to heat the coarse aggregate.

It is necessary, in all cases, to keep the freshly placed concrete covered or inclosed, and to keep the inclosure warm (not less than 55 deg. F.) until the concrete has hardened to its designed strength. The strength attained can be determined by testing small cubes or cylinders of concrete which were cast for the purpose at the time the concrete was placed.

The test cubes or cylinders must be placed on or near the main mass of concrete, so that their hardening will proceed at approximately the same rate as the rest of the concrete.

Paint Types and Specifications for Painting Concrete

What is the general type of paint that will give a satisfactory account of itself as a concrete paint, either exterior or interior work? Where can I get specifications covering the method of applying such paints?—B. J. M., Knoxville, Tenn.

Cement and oil paints is a term generally used to describe one type of concrete paint. This designation includes all paints made by grinding portland cement and other pigments in an oil vehicle. The vehicles commonly employed are linseed oil or a mixture of linseed oil with chinawood oils. White portland cement is generally used for whites and light shades; gray portland cement is ground into the darker shades. These paints dry to a hard, flat finish somewhat rough to the touch. They adhere tenaciously to galvanized iron, wood and concrete. The cement content gives the paint some degree of resistance to fire.

Cement and water paints is the designation applied to paints made by mixing dry portland cement with other pigments into water. The mixing occurs on the job, where the dry powder pigment is mixed with water. These paints adhere by a cement-to-cement bond when applied to clean concrete, but they do not always bond to smooth surfaces of other materials. No particular surface preparation is required, aside from a wetting down with water. Since time and moisture are necessary to the proper hardening of the cement in these paints, they should be allowed to dry rather slowly. Paints of this group dry to a flat finish.

Concerning your second question, regarding specifications for the application of concrete paints, you will find several available. In 1928 the Portland Cement Association issued such a specification as Technical Data Sheet No. 46. About the same time the American Paint and Varnish Manufacturers' Association published a similar specification as Circular No. 327.

Beach Sand Too Fine for Concrete Products Manufacture

I have a small concrete products plant near a point where beach sand is available. Would you recommend its use in the manufacture of concrete products? —J. E. S., East Cleveland, Ohio.

While no definite recommendation should be made against the use of the sand you mention, without first seeing it and testing it, the fact remains that beach sand, as a general thing, is entirely too fine to be used either in monolithic concrete or in concrete products such as brick and hollow concrete building units. Some manufacturers use no sand finer than the 50-mesh or the 30-mesh screen.

With an excess of very fine sand, such as you are likely to have with beach sand, the product is likely to become checked and to have low strength.

Removal of Oil Stains From Concrete Floors

The information given on this page in the December issue of CONCRETE, page 30, relative to the prevention and removal of oil stains on concrete floors, has brought additional information from a subscriber.

For the *removal* of existing stains and coatings of oil on concrete floors, his practice is to dissolve $1\frac{1}{2}$ lb. of caustic soda in each gallon of hot water, and to scrub the floor vigorously with the solution. After the cleaning is completed the floor must be washed thoroughly with clear water, to remove the remaining solution of caustic soda and prevent possible damage to the concrete.

Caustic soda, known also as sodium hydrate ($NaOH$), is a white solid substance used in soap making.

ORGANIZATIONS

American Association of State Highway Officials; W. C. Markham, Executive Secretary, 1222-24 National Press Building, Washington, D. C.

American Concrete Institute; Harvey Whipple, Secretary, 641 New Center Building, Detroit, Mich.
Twenty-eighth annual convention, March 1-4, Wardman Park Hotel, Washington, D. C.

American Concrete Pipe Association; M. W. Loving, Secretary, 33 West Grand Ave., Chicago.
Twenty-fifth annual meeting, February 1-2, Edgewater Beach Hotel, Chicago, Ill.

American Road Builders' Association; Chas. Upham, Engineer-Director, National Press Building, Washington, D. C.
Twenty-ninth annual convention and road show, January 9-15, Municipal Airport building, Detroit, Mich.

American Society of Civil Engineers; Geo. T. Seabury, Secretary, 33 West Thirty-ninth St., New York City.
Annual meeting, January 20-22, New York City.

American Society for Testing Materials; C. L. Warwick, Secretary-Treasurer, 1315 Spruce St., Philadelphia, Pa.

Associated General Contractors of America; E. J. Harding, Managing Director, 222 Munsey Bldg., Washington, D. C.
Thirteenth annual convention, January 18-21, Schroeder Hotel, Milwaukee, Wis.

Building Officials Conference of America; Col. John W. Oehmann, Secretary, 1253 Lawrence St., N. E., Washington, D. C.

Cast Stone Institute; L. A. Falco, Secretary, Chapel St. and Blatchley Ave., New Haven, Conn.

Cement Institute; Luther G. McConnell, General Manager, 11 East 44th St., New York City.

Concrete Masonry Association; Jack Franklin, Secretary, 7071 Plankinton Bldg., Milwaukee, Wis.
Annual meeting, March 1-2, Wardman Park Hotel, Washington, D. C.

Concrete Reinforcing Steel Institute; M. A. Beeman, Secretary, Tribune Tower, Chicago.

Engineering Institute of Canada; 2050 Mansfield St., Montreal, Quebec.

Joint Committee on Standard Specifications for Concrete and Reinforced Concrete; F. R. McMillan, Secretary, 33 West Grand Ave., Chicago.

National Board of Fire Underwriters; W. E. Mallalieu, General Manager, 85 John St., New York City.

National Concrete Burial Vault Association; J. H. Stuart, Secretary-Treasurer, Bremen, Ohio.

National Crushed Stone Association; J. R. Boyd, Secretary, 1735 14th Street, N. W., Washington, D. C.
Fifteenth annual convention, January 19-22, William Penn Hotel, Pittsburgh, Pa.

National Engineering Inspection Association; B. H. Witherspoon, Secretary, P. O. Box 1115, Pittsburgh, Pa.

National Fire Protection Association; Franklin H. Wentworth, Secretary, 40 Central St., Boston, Mass.

National Lime Association; Norman G. Hough, Secretary and Manager, 927 Fifteenth St., N. W., Washington, D. C.

National Ready-Mixed Concrete Association; V. P. Ahearn, Secretary, 545 Munsey Building, Washington, D. C.
Second annual convention, January 25-26, William Penn Hotel, Pittsburgh, Pa.

National Sand and Gravel Association; V. P. Ahearn, Executive Secretary, 545 Munsey Bldg., Washington, D. C.
Sixteenth annual convention, January 27-29, William Penn Hotel, Pittsburgh, Pa.

National Slag Association; H. J. Love, Secretary-Treasurer, 937 Leader Bldg., Cleveland, Ohio.

National Terrazzo and Mosaic Association; U. F. Durner, Secretary, 815 West St. Paul Ave., Milwaukee, Wis.

Northwest Concrete Products Association; W. P. Hews, Secretary-Treasurer, Yakima, Wash.

Portland Cement Association; Edward J. Mehren, President; William M. Kinney, General Manager, 33 West Grand Ave., Chicago.

Rail Steel Bar Association; H. P. Bigler, Engineering Secretary; Builders' Bldg., 228 N. La Salle St., Chicago, Ill.

Wire Reinforcement Institute; R. D. Bradbury, Director, National Press Bldg., Washington, D. C.

Wisconsin Concrete Products Association; Jack Franklin, Secretary-Treasurer, 425 East Water St., Milwaukee, Wis.

New Books and Pamphlets

Profit and Loss in Ready-Mixing Plant

Costs and Prices of Ready-Mixed Concrete in 20 Plants. Published by Chain Belt Co., Milwaukee, Wis. Copies available upon request, without charge.

Whether the ready-mixed concrete business is a good one is the question in answer to which this booklet has been published. The contents comprise a careful analysis of what is thought to be the first comprehensive study of this phase of ready-mixed plant operation.

It is the result of a survey undertaken of the costs and prices of twenty different ready-mixed plants in twelve different states.

Design of Water-Containing Tanks

Reinforced Concrete Reservoirs and Tanks. By W. S. Gray. Published by Concrete Publications, Ltd., 20 Dartmouth Street, London, England. Cloth, 212 pages, 5½ by 8½ in.; numerous design diagrams and halftone illustrations.

The purpose of this book is that of giving the designer the necessary formulas for the stress analysis of circular and rectangular water-containing tanks and reservoirs, both above ground and underground. There are also many valuable suggestions on construction methods and details, not the least of which includes a number of details of joints in floors and walls.

Various design methods and practices are discussed in detail, and the author points out what in his opinion are the simplest solutions of different designing problems.

Reinforced Concrete Reference Book

Arrol's Reinforced Concrete Reference Book. By Ernest A. Scott. Published by Spon & Chamberlain, 120 Liberty Street, New York. Cloth, 283 pages, 5½ by 8½ in.; numerous halftones, plates, design tables, and drawings. Price $6.50.

The examples, general formulas, model regulations and designing tables contained in this book are given as used by the reinforced concrete department of Sir William Arrol & Co., Ltd., of Glasgow, Scotland. Separate chapters, or parts, cover general requirements, definitions and abbreviations, notation, loads and pressures, materials, construction, load distribution and bending moments, stress and deformation calculations, and graphs and diagrams.

Estimating Building Costs

Estimating Building Costs, third edition, 1931. By Frank E. Barnes. Published by McGraw-Hill Book Co., Inc., New York and London. Flexible cover, 656 pages, 4½ by 7 in.; illustrated with halftones and line drawings; numerous tables. Price $5.00.

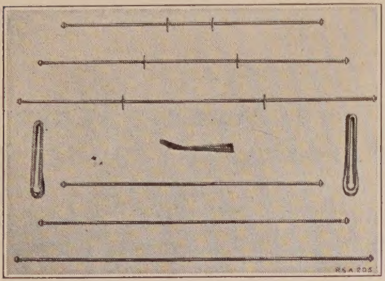
The author, who is building valuation engineer for the New York Central Lines, has prepared this third edition in order to meet the changed conditions due to the rapid advancement during the past few years, both by the discovery of new ideas and methods and by the improvement of old ones.

New Equipment and Materials

Snap-Ty Is New Foundation Wall Form Device

A self-cutting form tie for concrete foundation walls is made available in the new Snap-Ty, which snaps off by hand at the wall surface after stripping.

Snap-Tys are designed for use with 1-in. lagging, with 2 by 4-in. studs, and double walers, but may be used for forms of heavier lumber. They have a working load value of 3,000 lb. per tie, according to the Richmond Screw Anchor Co., Inc., Brooklyn, N. Y.



The ties are made for walls 4 to 24 in. thick and with or without the spreader feature.

The Snap-Ty holder is said also to be a remarkable step forward for safety and economy. It is a gravity type holder, so designed that vibration tightens it.

New Vibrating Screen for Bucket Loader

A new three-product vibrating screen for use with its Model 62 heavy-duty self-feeding bucket loader has just been introduced by the Barber-Greene Company of Aurora, Illinois. The screen is designed for operation in gravel pits, on road jobs, or in any place where bulk material must be classified by size.

The new screen is made up of two screen cloths vibrated at 1,200 v.p.m. by an alloy steel eccentric shaft driven by a power takeoff direct from the main transmission of the loader. A belt that can be easily removed and rethreaded transmits the power to the screen. This belt is provided with an automatic takeup to compensate for stretch or contraction.

The entire screen frame is vibrated in the center and cushioned on each end, and is counterbalanced so that no vibration is carried back to the loader frame.

Material discharged from the buckets of the loader falls first on a large mesh screen cloth which removes oversize, carrying it off over a steel chute. Shaken through the first screen, the material drops on a finer mesh below. The very finest size falls through this cloth onto a rubber belt conveyor which carries it out and discharges it at a point 9 ft. from the center of the machine, while that which remains on the second screen passes off over a chute directly in back of the loader. In this way, two trucks may be loaded at the same time. Screen cloths are provided in sizes to suit the individual user's need.

The whole screen is so mounted that it may be lowered to allow the loader boom to be rolled back for traveling, and raised to position again by a hand hoist.

Either loader or screen may be operated independently of the other.

Link-Belt Announces New Shovel-Crane-Dragline

Link-Belt Company, Chicago, Ill., have just announced the addition of a new shovel-crane-dragline, known as the K-48, to their line which ranges from ¾ to 2½ cu. yd. capacity.

The Link-Belt K-48, is an all-purpose unit, serving as a shovel, a crane, a trench hoe or a dragline. It can be furnished with any or all of the attachments which are usually only available on smaller machines. The K-48 is arranged for gasoline engine, Diesel engine, or electric motor drive. The gasoline engine has a heavy duty 130 hp. rating and the Diesel engine or electric motor is of corresponding capacity.

As a shovel, it is standardly equipped with a 25-ft. shovel boom, 17-ft. 6-in. dipper stick, and a 1¾-cu. yd. dipper.

As a crane, the K-48 has unusually large rated lifting capacities. All of these have a very liberal margin against tipping, this margin being 33⅓ per cent or more. It has a rated capacity of 32 tons at 12 ft. radius and 10,400 lb. at 45 ft. radius on a 45-ft. boom, and corresponding capacities at other radii and for other boom lengths.

As a dragline, it will handle 1¾ cu. yd. heavy or 2 cu. yd. light-medium bucket on a 45-ft. boom, and a 1½ cu. yd. heavy or 1¾ cu. yd. light-medium bucket on a 50-ft. boom, with the boom at any angle convenient for dragline work. It is necessary to work with a "high" boom or at limited radius to handle these loads, as these are conservative ratings which the machine will easily and safely handle.

As a trench hoe, the character of the work and the digging depth determine the size of the bucket used. For normal digging depth, in average soils, a 2 cu. yd. solid-bottom bucket is standard.

Syntron Launches New Vibrating Hammer Models

Two portable electric vibrating hammers, both simple in design, have just been placed on the market by the Syntron Co., Pittsburgh, Pa. These hammers consist of two electric magnets wound around a hollow barrel, reciprocating a free moving piston back and forth that strikes the vibrating tool directly on the shank.

The smaller and lighter model, No. 11-60, weighs 11 lb., strikes 3,600 blows per minute, and was designed primarily for vibrating forms made of light planking, using a tool with a mushroom shaped head for contact with the form work and for lighter reinforcing bars.

The more powerful hammer, known as the No. 16-60, weighs 16 lb. and was designed for vibrating heavy reinforcing bars and form work. It works on the same principle as the smaller hammer and has also only one moving part and no motors, gears, or bearings.

These and other electric tools are described in detail in a new catalog recently issued by the Syntron Co.

Seven Models in New Line of Industrial Compressors

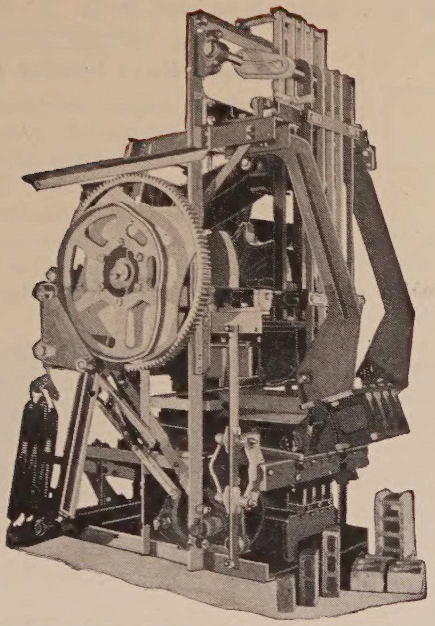
The Curtis Pneumatic Machinery Co. of St. Louis has developed a new line of industrial compressors, known as Curtis Model "C" Timken bearing compressors, which it is now ready to place on the market. The complete line consists of 7 models, 5 of the two cylinder type, ranging in size from 4¼ by 3¾ to 6½ by 5, with a displacement of 25 cu. ft. to 125

When the Books are Closed—

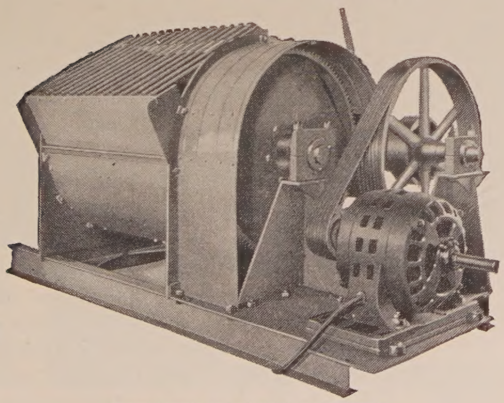
When the books of all the concrete products plants are closed for 1931 the biggest profit balances will go to those with the modern equipment.

During the coming season the up-to-date plant will earn a relatively greater margin of profit over its still more obsolete competitor.

Because Besser Strippers, Besser Mixers and all other Besser equipment are strictly modern in design, construction and operation they have made outstanding records for high quality product and low operating cost.



BESSER AUTOMATIC STRIPPER
Made in Three Capacity Sizes



BESSER BATCH MIXERS
Made in Seven Capacity Sizes

The Seven Divisions of BESSER SERVICE to The Concrete Products Industry

1. BESSER SUPER STRIPPER. 7 blocks, 14 slabs or tile or 42 concrete brick per minute.
   BESSER STANDARD STRIPPER. 6 blocks, 12 slabs or tile or 36 concrete bricks per minute.
   BESSER VICTORY STRIPPER. 4¼ blocks, 9 slabs or tile or 27 concrete bricks per minute.
   These Stripper Machines make the block on plain pallets and only one set of pallets required for a very large variety of product.
2. BESSER MASTER TAMPER FACE DOWN MACHINE. 3 to 4 blocks per minute.
3. BESSER BATCH PADDLE MIXERS in Seven Sizes. 5, 12, 18, 25, 30, 40 and 50 cu. ft. capacities.
4. AUTOMATIC CONCRETE BRICK MACHINE. 40 to 50 M per day.
   MASTER CONCRETE BRICK MACHINE. 10 to 20 M per day.
5. BESSER SEWER, CULERT AND DRAIN TILE MOLD. All sizes up to 5 ft.
6. CARS, PALLETS, ELEVATORS, ETC.
7. BESSER FACILITIES FOR SERVICE AND ENGINEERING ASSISTANCE.

Ask for Illustrated Catalogs of Besser Strippers and Besser Batch Mixers

BESSER MANUFACTURING COMPANY

COMPLETE EQUIPMENT FOR CONCRETE PRODUCTS PLANTS

Main Office and Factory, 201 32nd Street, Alpena, Michigan

District Sales Offices at

Detroit - Pittsburgh - Philadelphia - Newark - Dayton - Chicago - Milwaukee - Omaha - Indianapolis

better own a BESSER than compete with one

This advertisement is to help you get ready for better business

cu. ft. and two of the four cylinder type, a 5½ by 5¼ and a 6½ by 5¼ size, with a displacement of 115 cu. ft. to 262 cu. ft. The compressors are designed principally for wide use on road and building construction work. The model "C" compressors are furnished by the Curtis company not only as stationary simple compressors for belt drive from a line shaft, separate motor, steam engine or other prime mover, but are also furnished as complete self contained units, either direct connected or driven by multiple "V" belt. The compressors are likewise supplied with support wings instead of base mounting, when incorporated in portable units.

Outstanding among the design and construction features of the Model "C" compressors are the carbon-free valves, the use of Timken bearings on the crank shaft and the Curtis "Centro-ring" oiling method.

About Makers of Equipment and Materials

Industrial Literature

Scale Model Bulletin

The Third Dimension is the title of a 24-page bulletin issued by the *H. E. Boucher Mfg. Co.*, 150 Lafayette Street, New York, describing and illustrating scale models of buildings, bridges, terminals, park layouts, steamships and various other objects, made by this company.

Copies of the bulletin may be obtained by addressing that company.

Concreduct Publication

Data and detailed information on *Groundhog Concreduct* is contained in a 12-page booklet being distributed by *Edward N. Gackenbach*, Philadelphia, Pa.

Groundhog Concreduct is described as a multiple duct concrete conduit for high and low voltage and installations are shown under way and complete.

Joist Floor Economy

Another of the 4-page folders published in color by the *Concrete Reinforcing Steel Institute*, Chicago, furnishes "Authentic Proof That Reinforced Concrete Construction with Concrete Joist Floors Is Economical."

Buildings in which such construction was employed are illustrated and accompanied by a brief outline telling how a saving was made in each instance.

The Perfect Slab

The Perfect Slab is the title of a new booklet being distributed by the *H. W. Roos Company*, Cincinnati, Ohio.

It is a 20-page booklet describing a new method of erecting flat-slab forms with steel instead of wood. The forms are erected in such a way that they all can be removed and re-used without disturbing shores under the slab construction, according to the manufacturer. The equipment is thoroughly described, showing methods of procedure, speed of erection and quality of work produced, as well as typical jobs on which the equipment has been used. The standards for various types of buildings as well as special and adjustable units are described therein. Copy will be sent to those interested, on application.

Manufacturers' News

Electric Plant Section

A special cutaway model showing the construction and operation of Kohler electric plants will be included in the *Kohler of Kohler* exhibit at the Detroit road show.

In this special display plant there have been cut away sections of the vacuum tank shell, gear cover, cylinder head, cylinder block, governor housing, generator housing and oil base, to expose the direct-connected generator, the crankshaft and connecting rods and the design in general.

New Consolidated Address

The home office and factory address of the *Consolidated Concrete Machinery Corp.* since December 1 has been Alpena, Mich. This is also the address of the *Besser Mfg. Co.*

The two companies, which are now affiliated but not merged, are each continuing their lines of equipment, and generally maintaining separate sales organizations. The executive personnel of both companies is the same.

Vibrator Patent

Patent has been secured, under date of October 27, 1931, by *A. W. Munsell* and *E. L. Fickett*, on the vibrator which is their joint invention.

The vibrator is described as particularly adaptable to tamping concrete effectively, forcing it into the corners and angles of the form or mold, imbedding completely any reinforcing steel that may be present, and driving off excess water or releasing entrained air.

Pavement Reinforcement

The article, *The Design and Installation of Reinforcement in Concrete Pavements and Bases* has been issued in reprint form after having been published in *Public Roads.*

The author is James S. Burch, research engineer for the *Wire Reinforcement Institute*, Washington, D. C.

Wellman Buys Bucket Line

The Wellman Engineering Co. of Cleveland, Ohio, has acquired by purchase the clamshell bucket and heavy duty trailer business of the *G. H. Williams Co.*, Erie, Pa. The engineering, manufacture and sale of Williams buckets and trailers will be immediately transferred to the Wellman Engineering Co. plant in Cleveland.

Truscon Buys Berger Division

The Truscon Steel Co., Youngstown, Ohio, has taken over the *Berger Mfg. Co.* building products division at Canton, Ohio, and will continue to operate it as Berger building products division of the Truscon Steel Company, continuing with Berger's present policies and retaining on their staff their present selling organization.

Blaw-Knox Exhibit

Equipment to be displayed at the road show by the *Blaw-Knox Co.*, Pittsburgh, Pa., will include an improved Ord finisher, cement and aggregate weighing batchers, road forms, clamshell buckets, and a hydraulic scraper.

Storage Bin Model

The Butler Bin Co., of Waukesha, Wis., will exhibit at the Detroit road show a small working model of a three-compartment steel storage bin equipped with a weighing hopper with a three beam scale, an automatic bulk cement weighing hopper, the latest type aggregate weighing hopper, bin gates, etc. New literature devoted to bulk cement handling plants of both the automatic and manually operated types, will be ready for distribution. The exhibit will be in charge of *M. R. Butler*, *A. R. Morton* and *H. W. Butler*.

Automatic Cement Scale

A 400 to 1,000 lb. Model M-39 Duo-Screw feed automatic cement scale will be on display to road show visitors at the booth of the Richardson Scale Co., Clifton, N. J.

The scale will be supported by a special structural steel frame with access stairway.